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## EVOLUTION OF ARMOR PLATE.

SHORT HISTORY OF ITS MANUFACTURE BY REAR ADMIRAL CHAS. O'NEIL, CHIEF OF THE BUREAU OF ORDNANCE—ABOUT 50,000 TONS THUS FAR USED BY THE UNITED STATES.

Rear Admiral Charles O'Neil, chief of the bureau of ordnance, has written an interesting article descriptive of the manufacture of armor plate, which is printed in Collier's Weekly. Admiral O'Neil is particularly qualified to write on this subject, and the history of armor plate development which he gives is full of instructive information.

According to Admiral O'Neil the credit for the first systematic investigation of the action of projectiles on solid substances belongs to France, although Sir Isaac Newton, Robbins, Hutton and Rumford had previously experimented to some extent in the same field. The French experiments were carried on at Metz, beginning in 1830. Previous to this, however, John Stevens built at Hoboken in 1812 a vessel whose guns were protected by inclined armor. Congress paid no attention to this, but in 1842 Robert Stevens made a report on the effect of projectiles on armor, and submitted a design of a steam-propelled, armored war vessel, which was referred to the committee on coast defenses. Congress acted, and in 1854 the keel of the Stevens Battery was laid, a few months before the construction of ironclads began in Europe, where France led the way. By 1868 solid plates of 6, 7 and 8 inches thickness were tested, and in 1875 the first steel plates of Bessemer steel  $2\frac{1}{2}$  inches thick were tested showing only a slight advance over wrought iron. Then came the compound plates of iron and steel, which proved of greater resisting power than the all steel plates, but they flaked badly. Then, by the introduction of a small percentage of nickel into the all steel plates, the desired toughness was produced.

"This," Admiral O'Neil says, "was the armor situation when the United States government commenced the building of armored vessels for its new navy, and while the armor ordered for the first vessels was of plain steel, it was quickly followed by that containing nickel, as the result of the first important armor test made in the United States at the Annapolis proving ground in September, 1890; this test being made principally to determine the respective value of plain steel and of nickel-steel plates and also of compound armor. Three plates of equal dimensions, namely, 8 feet by 6 feet by  $10\frac{1}{2}$  inches, were subjected to similar attacks. They consisted of a compound plate made by Cammel & Co., of England, a plain-steel plate made by Schneider & Co. of France, and a nickel-steel plate also made by the latter. All three plates were subjected to five impacts by a 100-pound projectile, fired from a 6-inch gun with a striking velocity of 2,075 foot-seconds, one shot being directed at each corner of the plates, and a fifth impact by a 210-pound projectile, fired from an 8-inch gun with a striking velocity of 1,850 foot-seconds at the center of the plates. All three plates were supported by 38 inches of oak backing. The compound plate was perforated by all the shells, and practically destroyed by the 6-inch alone. The plain-steel plate kept out all the shells, but was badly cracked by the 8-inch. The nickel-steel plate kept out all the shells and remained without cracks."

These tests decided the government to adopt nickel steel armor. The next important step was the introduction of the Harvey process. Mr. Harvey's experiments attracting the attention of the navy department, it procured from Schneider & Co. a steel plate  $10\frac{1}{2}$  inches in thickness. This plate was treated at the Washington navy yard in January, 1891, under the direction of Admiral O'Neil in accordance with instructions prescribed by Mr. Harvey. The Harvey process, which consisted of hardening the face of the plate, was a secret, and no one was allowed in the building except the officer in charge and a few selected workmen. The admiral continues:

"The plate, having been placed in the furnace, was covered with a layer of carbonizing material (probably a mixture of animal and vegetable charcoal) about a foot thick, over which was laid a covering of tiles to exclude the flame and air from the plate. The doors of the furnace having been bricked up, the fires underneath were started, and it was brought up to a high heat and so maintained for about 100 hours. Arrangements had been made for withdrawing the plate from the furnace and for sprinkling it with cold water from a large trough with perforated bottom, suspended overhead at a height of some ten feet. When the time arrived for taking the plate from the furnace the brick work was knocked away and a yoke of oxen were hitched to a chain made fast to the plate. The oxen tugged in vain and a second yoke was brought into requisition, but still the plate remained immovable, the high and prolonged heat having vitrified the sand, tiles and brick into a solid mass. A large force of men was brought up to aid in the work, and, with the assistance of tackles and levers, the plate was, after five hours of labor, hauled out of the furnace and under the sprinkling trough. Naturally it had lost a good deal of its heat, and was of a dull cherry red when the water was applied, which formed hissing jets of steam as it fell on the hot plate, which, to the dismay of the spectators, began to curl up like a huge saucer as its upper surface contracted under the influence of the chill. The spraying was continued until the plate was cooled to a black heat, when it recovered its shape to some extent. The warping was then regarded as a serious objection to the process, but in future plates this was overcome by sprinkling on both sides, and in the regular furnaces the plates were thereafter laid on iron cars, and could thus be quickly withdrawn."

This plate showed remarkable powers of resistance, and the navy department conducted a series of experiments which resulted in proving the superiority of the Harvey plate. Admiral O'Neil gives much of the credit of bringing it forward to Capt. William M. Folger, U. S. N., who carried out the tests. The Harvey plate kept its place in the front rank

until 1895, when the Krupp process, a modification of the Harvey process, was introduced. England was quick to recognize the value of the improvements, and acquired the rights thereto in 1895. In 1898 the rights were acquired in this country. The first tests were of plates made by the Carnegie company and the Bethlehem company in October, 1898, when the excellence of the process was demonstrated. Krupp armor differs from Harvey armor in the character of the alloy and in the method of its treatment.

The manufacture of modern armor plate for service use began in this country in 1886. The total amount of armor furnished when present contracts are completed will be 35,773 tons. At the present time there is required for three battleships of the Maine class 7,360 tons. This armor has not yet been contracted for, as the question of kind and price is now before congress. The department desires to use armor made by Krupp's new process for these and for other vessels authorized but not yet contracted for, for which about 12,000 tons more will be required.

## FOR LAKE AND COAST SERVICE.

A Cleveland vessel owner who is close to some of the large negotiations which the American Ship Building Co. has under way says he would not be surprised to learn a little later that some twenty steel vessels of Canadian canal size will be built by Mr. A. B. Wolvin of Duluth and his associates, who are planning for the operation of these ships on the Atlantic as well as on the lakes. He says that the fleet of four or six now under order with the ship building consolidation are only the forerunners of a very large undertaking that is quite certain of enlisting the necessary capital.

Canadian vessel owners on the lakes are also alive to the advantages that are offered in this kind of vessel. R. O. & A. B. McKay of Hamilton, Ont., recently formed the Hamilton & Fort William Navigation Co., a corporation that is having built at Dundee and New Castle two steel steamers of full Welland canal size. These vessels are expected to arrive in this country in June. They will be employed during the navigation season on the lakes in carrying ore from Lake Superior to the blast furnace plant at Hamilton. A steel works is also building at Hamilton. The Canadian bounty on pig iron is said to admit of the successful operation and even the enlargement of the Hamilton works, as indicated by the building of the steel plant. It is expected, of course, that these Canadian steamers will engage in salt-water service during the winter period or when trade is dull on the lakes. Mr. A. B. McKay is now in England looking after them. One of them will be named Strathcona and the other Winona. R. O. & A. B. McKay also have due in Montreal next month a steamer called the Carlo, which they propose placing on the route between Fort William and Buffalo. This vessel will carry about 2,000 tons.

## NOT A STRONG OPENING.

The change in general business conditions, and especially towards lower values in iron and steel lines, has of course had its effect on the lake freight situation, at least to the extent that shippers of ore who had not fully covered the output which they planned from the head of Lake Superior are feeling more comfortable now than they were a few weeks ago. They are of the opinion that the market will be rather in their favor than against them. But this year is one in which the average vessel owner is not much interested in "wild" freights, excepting as to coal. His vessel property is to a large extent under contract. The Rockefeller interest stands practically alone with a large surplus of vessel capacity, but even if this capacity is chartered piecemeal during the season at rates below the \$1.25 ore basis the Rockefeller ships and their allied interests will probably have profited largely on the whole by the fact that in taking up this surplus tonnage the contract rate was made \$1.25. This tonnage is still the key to the season's freights.

With a decline in grain freights at the outset, it must be admitted that the opening is not encouraging, but some allowance must be made for the fact that as vessels were gotten under way ten days earlier than was expected, the ore shippers, as well as the producers of coal in many cases, were caught unprepared, and were even unable to take care of contract vessels. The decline in grain, both at Duluth and Chicago, was largely due to a rush for first grain cargoes for these vessels.

## NAMES OF CARNEGIE VESSELS.

Some of the leading colleges are to be honored in the naming of the six large steel vessels that are building at works of the American Ship Building Co. for the Pittsburg Steamship Co., which is the corporation controlling Carnegie vessel property on the great lakes under the direction of Mr. Edwin S. Mills of Cleveland. The first of these vessels, a steamer, to be launched about May 5, will be named Harvard. Then will follow the names Lafayette, Princeton, Cornell and very probably Columbia for the other four steamers to come out in the middle and latter part of the season. The one steel tow barge in the new fleet will be named Bryn Mawr.

Vice-president Farrington of Buffalo says he knows of no grounds for the report that the Northern Steamship Co. is making arrangements for the construction of two new passenger steamers similar to the North West and North Land now operated between Duluth and Buffalo. The story came from Minneapolis, but there was nothing official about it. It was to the effect that the Chicago-Buffalo route will be covered by the two new boats and that the schedule will be so arranged that the boat from Chicago will meet the Duluth-bound boat from Buffalo at Mackinac, while the Buffalo-bound boat from Duluth will meet the Chicago-bound boat from Buffalo at the same port.



## SHIPS FOR ATLANTIC SERVICE.

MOST PROMISING OUTLOOK FOR SHIP BUILDERS OF THE GREAT LAKES IS IN THE CONSTRUCTION OF STEEL VESSELS SUITED TO PASSAGE THROUGH CANADIAN CANALS—AFFAIRS OF THE AMERICAN SHIP BUILDING CO.

It is quite evident that the American Ship Building Co. (consolidated lake yards) looks for a very large business during the next few years in the construction of steel vessels of a kind suited to passage from the lakes to the Atlantic seaboard. Mr. W. L. Brown, president of the American company, who was in Cleveland a few days ago, said that the outlook for orders of this kind, based on the six vessels that are to be built for a syndicate made up by Mr. A. B. Wolvin of Duluth, is the most promising feature of lake ship building at the present time. These vessels, which are to be 256 feet over all, 242 feet keel, 42 feet beam and 26 feet depth, are to be designed so that they will carry about 2,400 tons on the limited draught of the canals and about 3,500 tons on salt water. Mr. Brown has been east on two or three occasions of late investigating the conditions that would be met by such vessels on the Atlantic, and is about to make another trip to New York for the same purpose. He says that while this type of vessel will, of course, be built to cross the Atlantic with cargoes from the lakes, the demand for them will be to a greater extent in the trade with South America, with Cuba and with Porto Rico. There is every reason why the construction of this kind of vessel should be almost entirely on the lakes, Mr. Brown says, on account of the experience that has been gained here by force of shallow channels in designs for maximum cargo on minimum draught. But the additional strength required for ocean service is not being overlooked in the design of this first fleet of three steamers and three tow barges for Mr. Wolvin and his associates. Drawings have been submitted to representatives of the Bureau Veritas and they will have the approval of that classification society before the work of construction is begun. The tow barges will very probably be made even stronger than the steamers, as with no steam power to steady them in heavy weather they would be subjected to rougher usage than the towing vessels. With the use of steam towing machines it is not expected that there will be much more difficulty in handling **tows** of this kind on the Atlantic than there is on the lakes, provided, of course, that the vessels are very well built.

Referring to the purchase of the plant of the Buffalo Dry Dock Co. by the American Ship Building Co., Mr. Brown said: "We will not enter into any great expenditure of money at these works. We purchased the Buffalo property so as to be able to care for the repair of vessels there as at other places. We have works around the lakes of ample capacity for new construction, and anyhow it is not the intention with our company to reach out in spending money. It is my ambition to have affairs of consolidated organization conducted along the conservative lines of the best of the old companies and thus far I think we have succeeded fairly well in this regard without displacing to any great extent the men who have made the ship building industry of the lakes."

The American Ship Building Co. is now in possession of the Buffalo Dry Dock Co.'s works. The price paid for the property is not given out. The capital of the Buffalo company was \$350,000 of preferred and \$250,000 of common stock. The property includes two dry docks, one 375 feet long, 45 feet wide on top, 42 feet wide at bottom and 13 feet over sill; and the other 280 feet long, 40 feet wide on top, 38 feet at bottom and 11 feet over sill. There is 315 feet of water frontage in the yard and 601 feet length.

Superintendent Calderwood of the new Steel Ship Building Co. of Collingwood, Ont., in which Capt. Alex. McDougall is interested, has begun the erection of buildings. This is the company that has taken over the old Collingwood Dry Dock Co.'s plant on a bonus arrangement with the town. Some of the machinery to be used is from the Everett ship yard on Puget sound, which was closed some time ago. This machinery is already on the ground. Three buildings, a punch shop and mold loft, a furnace and blacksmith shop, and an office will be erected. The first, which will stand on the east side of the dry dock, will be 220 feet in length and 50 feet in width, with a large addition for an engine and boiler room. This building will be two stories high and will contain the greater portion of the heavy machinery. The second floor will be equipped as a mold loft. The second building, 120 by 50 feet, will contain the plate and bar furnaces, the steam hammer and the blacksmith shop. The office will be in all respects equal to the requirements of the works. The yard will be so arranged that work on four vessels may be carried on at one time, and it is expected that at least one vessel will be completed during the present year.

The passenger steamer Mary, which is to run between Chicago and Benton Harbor this summer for the Graham & Morton Transportation Co., and which has been rebuilt from water line up, was launched from the company's yards at Benton Harbor last week. The Mary is 126 feet long, has large power, and is expected to make two round trips per day.

The Canadian canal-size steel steamer Ravenscraig, which is being built by the Jenks Ship Building Co. at Port Huron for the Volunteer Transit Co. of Cleveland (Wilson interest), was launched on Wednesday afternoon with appropriate ceremonies. This vessel is 257 feet over all, 243 feet keel, 43 feet beam and 26.6 feet deep.

It is understood from very good authority that the works of the American Ship Building Co. at West Bay City will not be closed down when the two large steamers under construction there are completed. According to present arrangements some more new work is planned for the West Bay City yard.

The Bertram Engine Works Co., Toronto, recently placed orders with the Jones & Moore Electric Co., Toronto, for one 20 and one 10-horse-power, 500-volt direct-current motors for their ship yard.

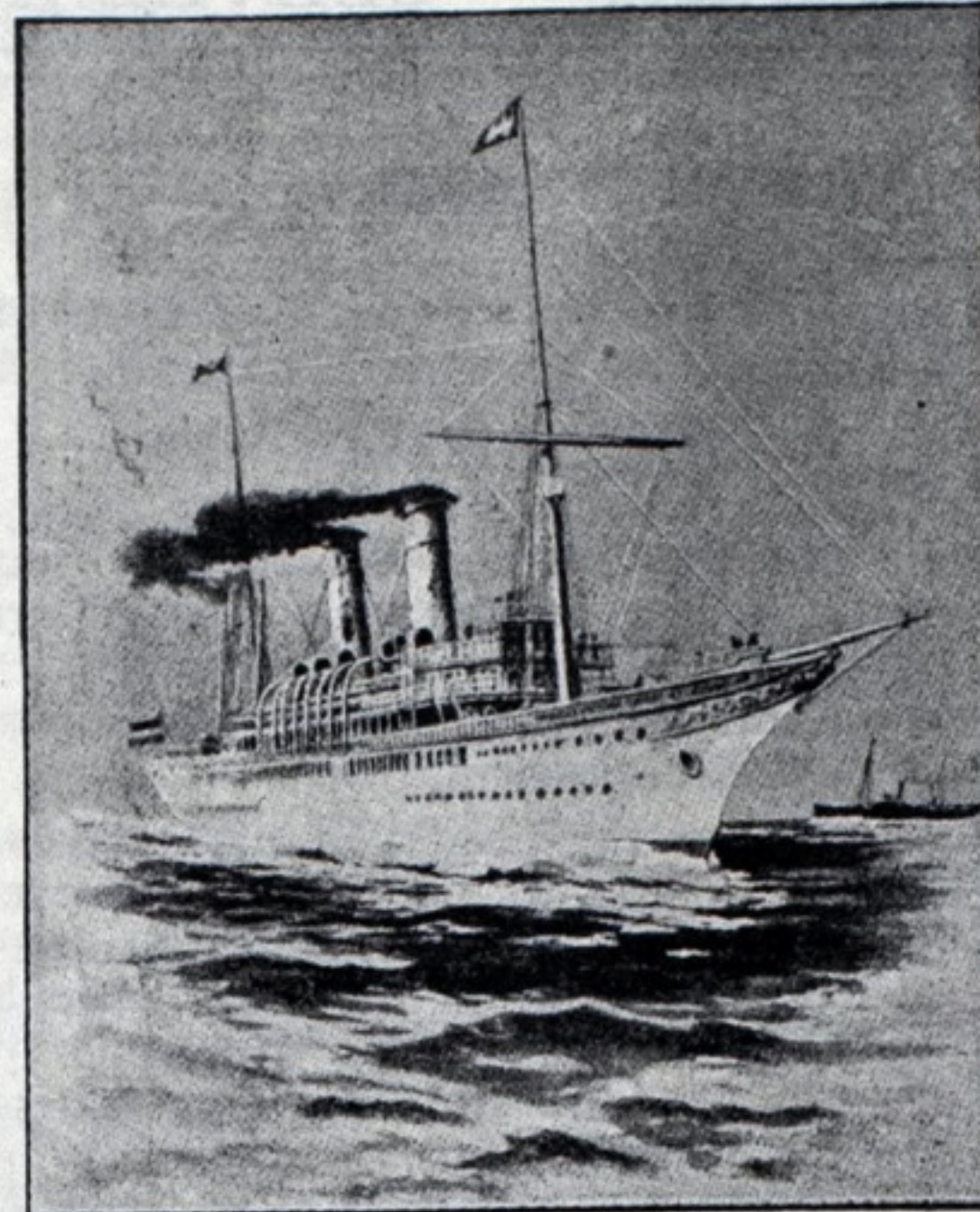
The Donnelly Contracting Co. of Buffalo will build a large scow to be used in breakwater construction.

The Pittsburg Chamber of Commerce has petitioned the secretary of the navy to name one of the new armored cruisers Pittsburg.

The North German Lloyd Steamship Co. has declared a dividend of 7½ per cent.

## A CRUISE AROUND THE WORLD.

The Prinzessin Victoria Luise, the large twin-screw yacht built for the Hamburg-American line, will start from Hamburg on her first cruise round the world on August 28. The course will be eastwards and the duration of the voyage about 135 days.



PRINCESSIN VICTORIA LUISE.

The yacht, as will be seen, is a gracefully-proportioned craft of 446 feet length, 47 feet beam and 30 feet depth, the displacement being 5,800 tons and the indicated horse power of the twin-screw engines 3,600. Needless to say, every provision has been made for ensuring the safety of the vessel and those who are to voyage in her, the hull being built of the best steel and to the scantlings required by the highest classification, additional security being provided by dividing the yacht into nine watertight compartments by means of eight transverse bulkheads extending to the upper deck. While strength and safety have been the dominant factor in the structure of the Prinzessin Victoria Luise the comfort and convenience of those who are to people her have also received due attention, for in addition to the dining saloon

containing fixed seats at tables for 200 persons, an elegant drawing room and a spacious smoke room, there is also a hall for kinesipathy (Zander's system), a reading room and a fully equipped dark room for the ubiquitous amateur photographer. There is an exceptionally large promenade deck, sheltered from both sun and rain, and the ship will carry an excellent band. Special care has been taken to fit up the spacious state rooms both tastefully and comfortably. Among the numerous improvements those made in the arrangement for sleeping deserve particular notice. For the beds are not placed one above another, as berths on steamers generally are, but side by side or opposite each other. Consequently the comfortable and elegantly furnished cabins present the same appearance as bedrooms at home. No stateroom contains more than two beds, and there are a number of cabins with only one bed for the use of passengers who set store upon having rooms entirely to themselves. Special rooms are provided for servants, and all rooms are fitted with electric light, steam-heating apparatus, electric bells, electric ventilators, and, in addition to the furniture usually provided on ships of the latest type, they are supplied with wardrobes and chests of drawers to meet the requirements of such long voyages as are to be undertaken by the Prinzessin Victoria Luise.

## NAVAL APPROPRIATION BILL.

The naval appropriation bill has passed the house with the provision of \$545 for armor stricken out. The price of armor is therefore left at the discretion of the secretary of the navy. The secretary, of course, will purchase Krupp armor to complete the Maine, Missouri and Ohio. Mr. Foss, the ranking member of the committee on naval affairs, made the following statement regarding the provisions of the bill as to armor plate and removing restriction on construction of ships authorized last year:

"In my judgment the provision in regard to armor plate as it passed the house, authorizes the secretary of the navy to procure by contract armor for the battleships Maine, Ohio and Missouri without any limitation as to the price. The point of order by Mr. Vandiver of Missouri against the provision as reported in the bill, applied purely to the words 'five hundred and forty-five dollars,' and that point of order having been sustained, the words 'five hundred and forty-five dollars' are stricken out, and therefore it leaves the question of price entirely in the discretion of the secretary of the navy. A point of order was also made on that provision of the bill which provided for the removal of the restriction on construction which was placed by the last naval appropriation bill upon the battleships Georgia, New Jersey and Pennsylvania, ships of 13,500 tons displacement, and the three armored cruisers California, Nebraska and West Virginia, of 12,000 tons displacement. Point of order was sustained. It is much to be regretted that any one of the other side of the house should have made the point of order against the removal of this restriction, which would have permitted the construction of these vessels to have gone on. I am informed that the plans are practically ready, and the letting of contracts for their construction should be done at once, but the people will understand that the responsibility is not upon the naval committee or upon the republican side of the chamber."

The bill as it stands does not authorize the removal of the restriction to limit the price of armor to \$300 which was contained in the last naval appropriation act and which applies directly to the three battleships and three armored cruisers provided for in that act. This feature will undoubtedly be made the subject of future legislation.

The bill reduces the appropriation for the survey and charting of the waters of Cuba, Porto Rico and the Philippines from \$100,000 to \$10,000.

A storm overtook the auxiliary cruiser Prairie on her trip to the Paris exposition, and the models of the American battleships which were part of her cargo, were badly damaged. The model of the Olympia, Dewey's flagship, was the most severely injured. Others are the models of the battleships Illinois and Texas, and the armored cruiser New York, the gunboat Yorktown and the old Kearsarge. They are being repaired under Constructor Gilmore's direction at Cherbourg.

Three months' subscription to the Marine Review will be given for a copy of our issue of August 11, 1898.



## JAPANESE BATTLESHIP ASAHI.

A VESSEL OF 15,200 TONS DISPLACEMENT AND 15,000 HORSE POWER—BUILT ON THE CLYDE AND NOW READY FOR DELIVERY—EQUIPPED WITH BELVILLE BOILERS.

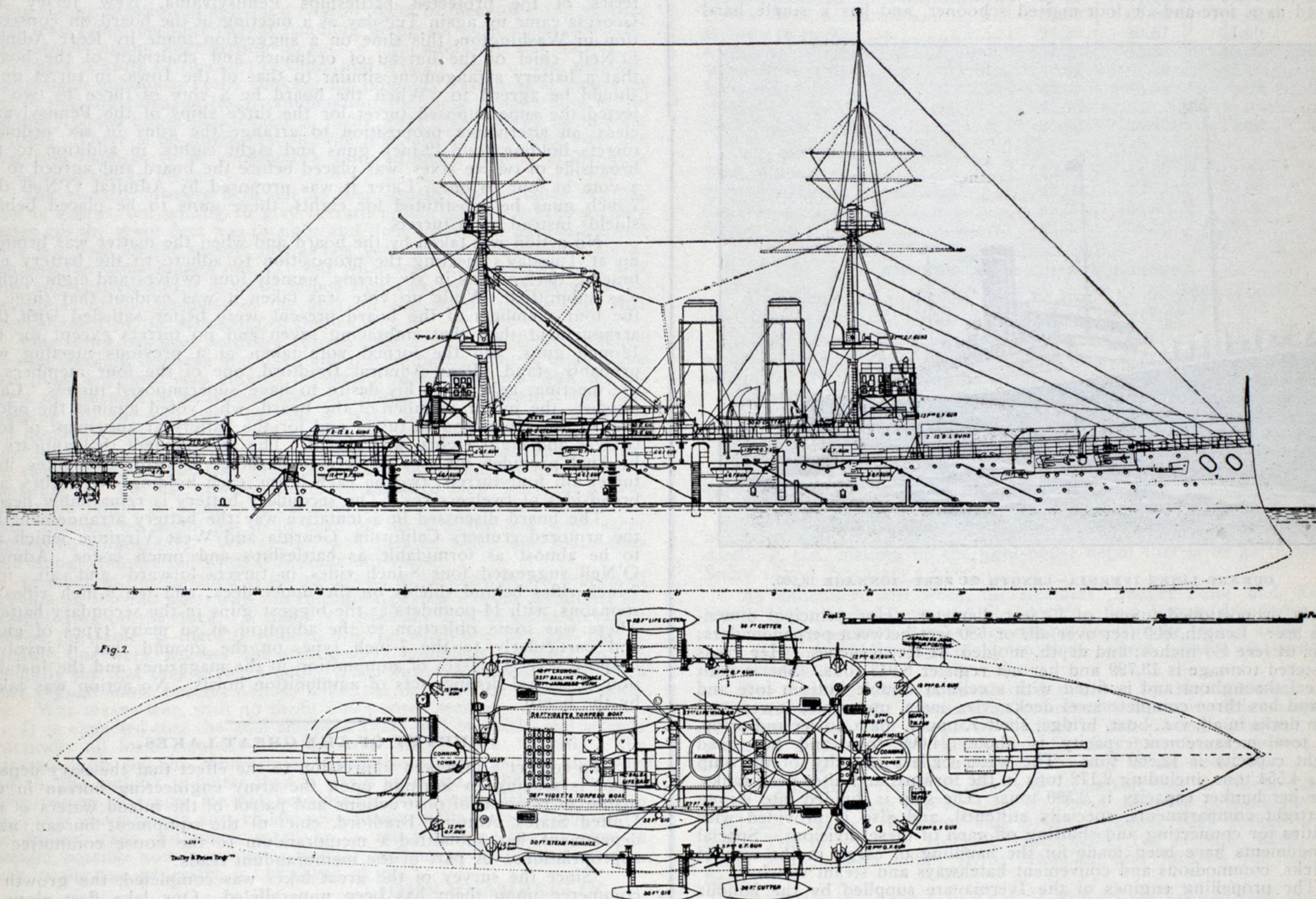
The battleship Asahi, built for the Imperial Japanese navy by Messrs. John Brown & Co., Limited, at their Clydebank establishment, has just had a most successful series of trial tests. The battleship is the largest one in the Japanese navy and is of the following dimensions: Length between perpendiculars, 400 feet; length over all, 425 feet 6 inches; breadth, extreme, 75 feet 2½ inches; depth, moulded, 43 feet 7½ inches; normal mean draught of water, 27 feet 3 inches; displacement, 15,200 tons; indicated horse power, 15,000.

Four 12-inch guns of the most modern type are mounted in pairs in two barbettes, one forward and the other aft, on the middle line of the vessel, each pair commanding an uninterrupted arc of training of 240 deg. The manipulation of the machinery and all the operations of loading and laying the guns are performed by hydraulic power; the loading can be performed with the guns in any position of training. The guns and gunners are well sheltered by means of heavy armored shields, which revolve with the turntables. The secondary armament consists of fourteen 6-inch quick firing guns, each mounted in a separate casemate;

The whole of the armor-plating was manufactured by Messrs. John Brown & Co., Limited, Sheffield, and is of the highest quality procurable, every plate having been treated by the improved Harveyed nickel-steel process, except those for the conning tower, where experience shows that the curvature of the plates is too great to enable this process to be successfully employed; these plates are consequently made of ordinary Harveyed steel. As a protection against attacks from torpedoes, a broadside net defence is fitted for a length of about 300 feet amidships; the nets are supported by steel booms, and when not in use stow on a convenient shelf worked round the sides.

The ship is propelled by two sets of three-cylinder triple-expansion engines. Each of the two sets is designed to develop 7,500 indicated horse power, giving a combined indicated power of 15,000. Steam is supplied by eighteen water tube boilers of the Belleville economizer type, working at a pressure of 300 pounds, which is reduced at the engines to 250 pounds. The diameters of the high pressure cylinders are 32½ inches, of the intermediate pressure cylinders 52 inches, and of the low-pressure cylinders 85 inches, all having a stroke of 4 feet.

The vessel left Portsmouth Harbor on Tuesday, March 20, and after compasses had been adjusted, a few low-speed runs on the measured mile at Stokes bay were made with the following results: Mean speed, 6.69 knots, indicated horse power, 613; speed, 9.28 knots, indicated horse power, 1,610; and for a speed of 13.06 knots the indicated horse power was 4,355. On Wednesday, the 21st, the vessel ran her coal consumption



LONGITUDINAL SECTION AND DECK PLAN OF THE JAPANESE BATTLESHIP ASAHI.

(From Engineering of London.)

twenty 12-pounder, eight 3-pounder, and four 2½-pounder quick-firing guns, with four submerged torpedo tubes in two compartments, one forward and one aft.

Great care has been bestowed upon the arrangement of the protective material. There is a main belt extending for a length of 250 feet amidships, the total depth of this belt being 8 feet 2 inches, and it is intended that when the ship is floating at the normal water line the lower edge of the armor will be 5 feet 6 inches below water, and the upper edge 2 feet 8 inches above water. The maximum thickness of this belt is 9 inches. The central citadel of armor is completed by transverses or bulkheads extending obliquely across the ship and enclosing the bases of the barbettes which protect the positions for the heavy guns. Forward and aft of this main belt the protection of the water-line region of the ship is completed by armor carried to the bow and stern. Above the main belt the sides from lower to main deck are covered with armor of a thickness of 6 inches; this belt extends for a length of 250 feet, and is completed by oblique transverses at the ends as described for the main belt. Armored doors are fitted in these transverses for affording convenient means of communication along the deck when in port. The protection of the vitals of the ship is rendered the more secure by a heavy protective deck extending all fore and aft, and sloping away from the underside of the main armor belt. The protection to the armament is arranged in a very thorough manner. For the 12-inch guns at the extremities circular barbettes rise from the protective deck to a height of 22 feet 4 inches above the normal water line; these barbettes are plated with armor of a maximum thickness of 14 inches. Each 6-inch quick-firing gun is enclosed in a casemate with an armored front 6 inches thick. The forward conning-tower is composed of 14-inch armor, and the after tower of 3-inch armor.

trial with the result that at 12,947 indicated horse power the consumption only averaged 1.59 pounds per indicated horse power per hour. The contract stipulated that this trial should take place with a development of at least 12,200 horses, so that with the high power developed the low coal consumption is all the more creditable. But for the fact that the wind and sea were both too high, a speed trial at this power would have been made over a 12-knot course. From the records taken, however, it appeared certain that the speed at this power may be fairly taken to be about 17½ knots.

The full-speed trials took place March 23, on the selected deep water course between Berry Head and Start Point, a distance of 12.25 knots. Four runs were made in alternate directions, the first and third being in the teeth of a northeasterly gale. Notwithstanding this, the mean speed realized was 18.3 knots. The speeds on the four runs were as follows: First run, 17.92 knots; second run, 18.08 knots; third run, 18.65 knots; and the last 18.30 knots, the mean of means being 18.30 knots, as before stated, with a mean indicated horse power of slightly over 16,000. After the full-speed trial, circles were made to port and starboard with each steam-steering engine, the vessel meanwhile being at full speed. Manoeuvring with the hand-steering wheels was also successfully carried out at a speed of 15 knots. The usual stopping, starting, and reversing trials were made on the return voyage to Spithead, the return passage being made at a speed of 17 knots.

Senator Hale has introduced a bill in the senate to appropriate \$200,000 to purchase the floating dry dock now at Havana, Cuba. This amount is the sum that Spain has demanded for the dock but which the navy department all along has regarded as excessive.

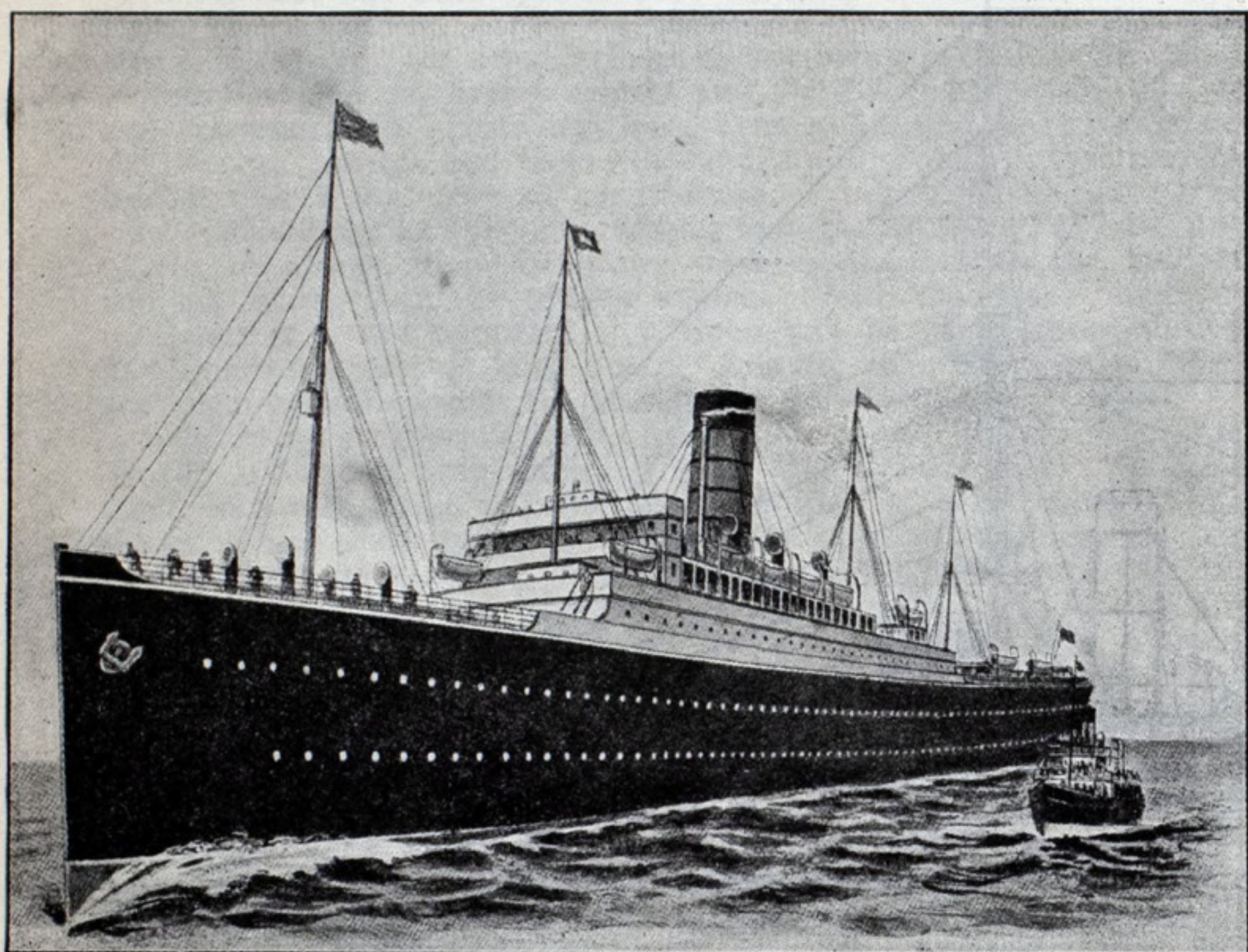


## NEW OCEAN LINERS. 0788

FIRST TRIP OF THE CUNARD IVERNIA, A VERY LARGE FREIGHT AND PASSENGER STEAMER—ALLAN LINER TUNISIAN AND THE ELDER-DEMPSTER CO.'S LAKE CHAMPLAIN FOR DOMINION SERVICE.

The new Cunard twin-screw steamer Ivernia has just made her first trip across the Atlantic. She is the latest addition to the red-funnel fleet, and while not as fast as some of the same line is a commodious and speedy ship. She has been built to maintain a paying freight service and at the same time obtain a share of the passenger traffic. This ship, which was delivered to the Cunard company by the builders, Messrs. C. S. Swan and Hunter, Limited, of Wallsend-on-Tyne on March 27, is by far the largest vessel built on the east coast of England, and is exceeded in size by only two ships afloat of any type.

The Ivernia presents a very imposing appearance, having a freeboard loaded of 28 feet, and above the line of the shelter deck, to which the plating and full scantlings are carried, she has three tiers of erections amidships, excluding the wheel house and chart room on the navigating platform level. The measurement from the keel plate to the standard compass platform, that is, the flying bridge deck, is 83 feet. When loaded her bridge is on a level with the main yard of a large sailing ship, while from the waterline, loaded, to the top of her funnel is 106 feet. She is rigged as a fore-and-aft four-masted schooner, and has a single hand-



CUNARD LINER IVERNIA—LENGTH 600 FEET—TONNAGE 13,900.

somely proportioned funnel of 17 feet diameter. Her principal dimensions are: Length, 600 feet over all, or 580 feet between perpendiculars; beam, 64 feet 4½ inches; and depth, molded, 41 feet 6 inches. Her gross registered tonnage is 13,799 and her net register 8,913 tons. She is built of steel throughout and is fitted with a cellular double bottom fore and aft, and has three complete steel decks, viz., main, upper and lower, and seven decks in all, viz., boat, bridge, shelter, upper, main, lower and orlop. Her total measurement capacity is about 24,000 tons and her dead weight capacity is 12,860 tons. The water ballast capacity of the ship totals 4,554 tons, including 2,172 tons in the forward and after peak tanks, while her bunker capacity is 2,500 tons. The ship is divided into eleven watertight compartments, specially stiffened, and also is provided with facilities for connecting and shutting off each of these divisions. Special arrangements have been made for the handling of cargo in the way of derricks, commodious and convenient hatchways and steam winches.

The propelling engines of the Ivernia are supplied by the famous Tyne engineers, the Wallsend Slipway & Engineering Co., Limited. They consist of twin sets of quadruple expansion four-crank balance type. The cylinders are 28½, 41, 58½ and 84 inches diameter with a piston stroke of 54 inches. These are arranged with the high pressure cylinder forward, followed in turn by the low pressure, second intermediate and first intermediate cylinders. Steam is supplied by nine large single-ended boilers of 15 feet 6 inches by 11 feet 6 inches at a working pressure of 210 pounds per square inch.

The vessel has accommodations for 160 first-class, 200 second-class and 1,600 third-class passengers. The main saloon is a really delightful and very spacious apartment, situated a little before amidships and extending the full width of the ship. The saloon is furnished in light oak while the revolving chairs are of rosewood. Nearly all of the first-class staterooms are situated on the promenade deck. These apartments are excellently furnished, are light and commodious and perfectly ventilated. Some splendid family rooms are also available. The accommodation for second-class travelers is situated on the shelter deck abaft the saloon, pantry and kitchen. The third class might be said to obtain conditions of ocean travel not offering in some ocean-going steamers of the second class. They are accommodated for in rooms of two, four and six persons. Each room contains iron frame beds, with spring bottoms, lavatories and other furnishings practically unknown in such quarters. They dine at mahogany tables on settees with reversible backs and cushions, and generally enjoy special favors. There are lavatories with hot and cold water and other sanitary fittings of the latest type. A spacious sheltered promenade deck is set apart for their use in bad weather.

The new twin-screw Allan liner Tunisian has just made her maiden voyage from Liverpool to the Dominion. The Tunisian is an 8½-beam ship, a ratio of length to width which does much to conduce to

weatherly qualities in a seaway, and consequently enhances the comfort of the passengers. The Tunisian is a sister ship to the Bavarian, which made her maiden voyage to Canada in August of last year. Dimension of the Tunisian are: Length, 520 feet; beam, 60 feet; depth, 43 feet; gross tonnage, 10,576. She has one large funnel with two pole masts and the usual derrick attachment. First and second-class passengers are carried amidships, where, of course, there is a minimum of motion. On the promenade deck, above the bridge deck, are suites of rooms en luxe. These apartments are self contained, and include bed rooms, sitting rooms, and bath and lavatory accommodations en suite.

The steel twin-screw steamer Lake Champlain, built to the order of Elder, Dempster & Co. for mail and general service between the United Kingdom and Canada, was recently launched at Liverpool. This vessel's principal dimensions are: Length, 465 feet; beam, 53 feet; depth, 38 feet 7 inches to shelter deck, with a gross tonnage of 7,550 and a deadweight capacity of nearly 8,000 tons. The passenger accommodation is fitted amidships under the shade deck, ample provision being made for about 100 first-class passengers, who will be berthed in large, handsomely-furnished and well-ventilated staterooms.

## BATTERIES OF THE NEW BATTLESHIPS.

The question of the character and the arrangement of the main batteries of the projected battleships Pennsylvania, New Jersey and Georgia came up again Tuesday at a meeting of the board on construction in Washington, this time on a suggestion made by Rear Admiral O'Neil, chief of the bureau of ordnance and chairman of the board, that a battery arrangement similar to that of the Iowa, in turret guns, should be agreed to. When the board by a vote of three to two rejected the superimposed turret for the three ships of the Pennsylvania class, an alternative proposition to arrange the guns in six ordinary turrets holding four 12-inch guns and eight eights, in addition to the broadside of twelve sixes, was placed before the board and agreed to by a vote of four to one. Later it was proposed by Admiral O'Neil that 7-inch guns be substituted for eights, these guns to be placed behind shields instead of in turrets.

No action was taken by the board and when the matter was brought up at Tuesday's meeting the proposition to adhere to the battery embracing twelve guns in six turrets, namely four twelves and eight eights, was submitted. While no vote was taken it was evident that three of the four members of the board present were better satisfied with this arrangement than that embracing seven and no turrets except for the 12-inch guns, and the formal vote taken at a previous meeting will probably stand. Rear Admiral Bradford, one of the four members at the meeting, adheres to his desire to have superimposed turrets. Capt. Sigsbee, the junior member of the board, who voted against the adoption of the superimposed turret and for the battery arrangement of four twelves and eight eights, was absent. The arrangement that appears to be final provides for two twelves in a turret forward, two sixes in a turret aft, four turrets, two on each beam, each holding two eights, and broadsides of twelve sixes. The secondary battery is remarkably heavy.

The board discussed in a tentative way the battery arrangement for the armored cruisers California, Georgia and West Virginia, which are to be almost as formidable as battleships and much faster. Admiral O'Neil suggested four 8-inch rifles in turrets forward and aft, four 7-inch rifles behind shields on the upper deck, and ten 6-inch rifles in sponsons, with 14-pounders as the biggest guns in the secondary battery. There was some objection to the adoption of so many types of guns, and particularly to the 7-inch type, on the ground that it involved keeping several classes of ammunition in the magazines and the installation of several distinct sets of ammunition hoists. No action was taken by the board.

## SURVEY OF THE GREAT LAKES.

To correct a mistaken impression to the effect that the navy department is seeking to infringe upon the army engineering bureau in the matter of removal of obstructions and patrol of the inland waters of the United States, Admiral Bradford, chief of the equipment bureau, navy department, has submitted a memorandum to the house committee on appropriations. A part of the memorandum reads:

"Since the survey of the great lakes was completed, the growth of commerce upon them has been unparalleled. Our lake fleet alone is greater than the fleet of any foreign nation, excepting that of Great Britain and Germany. In recent years the amount of tonnage annually constructed on the great lakes has been greater than that constructed on the Atlantic, Pacific and gulf coasts combined. More than half of the best steam tonnage in the United States is owned upon the great lakes. The vessels in these waters have increased very much in size as well as in numbers, and their increased draught brings them into contact with obstructions which were not necessary to consider in a survey of a generation ago when deep draught vessels were not employed in the navigation of the lakes. It has become necessary in some of the shoaler straits and channels to use a drag in order to discover isolated rocks and other obstructions of small superficial area. This work can only be done by nautical people who understand the needs of the safe navigation of ships. All expenses in connection with lake surveys, not including, however, the ordinary expenses of the ship, are defrayed out of the appropriation for ocean and lake surveys."

Alike to many other devices of a meritorious kind, the releasing hook for life boats made by Standard Automatic Releasing Hook Co. of 17 State street, New York, James R. Raymond, manager, was at first slow in meeting with favor, but it is now so much in use on government vessels and on the best passenger lines that its adoption as a standard article in reality as well as in name is assured. An attractive storm picture exemplifying the use of this hook is being distributed among ship builders and ship owners.

The Nickel Plate road offers special low rate of one cent a mile traveled to Findlay, O., account annual encampment of G. A. R., department of Ohio. Tickets available May 7, 8 and 9, good returning until May 11 inclusive. Inquire of agents or address C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 56, May 9.



## OUTLOOK AT BUFFALO.

MANY DIFFICULTIES AT THE START, BUT A SEASON OF GREAT ACTIVITY IS NEVERTHELESS EXPECTED IN ALL LINES OF LAKE TRADE.

Buffalo, April 25.—It will have to be admitted that marine matters, so far as this port is concerned, are most uncomfortably mixed. We are comforted by the belief that, with a single exception, we are past the war stage, but it will take awhile with the best of management to straighten matters out. We are in line for business as we were not a year ago, but that is all that can be said yet. To typify the state of things the big steamer Yale, after fighting her way stubbornly through the ice and fog in order to open the navigation season properly, went on the bottom at the entrance of the harbor and staid there a good long while.

Here are some of the shapes we are in: No boss scoopers to go at work on the grain till Supt. Kennedy directed the old ones to report awaiting the pleasure of the union to name new ones; deadlock between the owners of lumber tonnage and the shippers; war of the deadliest between the tug lines; navigation opening with a bang several days before the shippers or vessel owners looked for it and next to nothing loaded to go, either in coal or package freight; canal open officially, but all the boatmen standing on the street corner without a pound of freight to carry; lumbermen arousing the ire of certain of the brokers by agitating the proposition to appoint a charter agent of their own and making their own rates; package-freight handlers going to work under the contract system again, after setting up such a fight against it last season.

There is more of this sort of thing and it is all more or less perplexing, though nobody is really looking for difficulty except as it comes to this or that individual or lesser combination, for there is something in the old story of the house that leaned so many ways that it stood up in spite of itself. There is no doubt that the tug lines are in for a long war, but their loss happens to be somebody's gain, although nobody really likes to see such things go on.

The elevator owners held out as they usually do, all after the big slice of shares, but willing to give in rather than get no bread, so they waited till the grain fleet was in sight and then signed the agreement and there is a pool for the season, just as last year, with a half cent for elevation and the canal houses out. It was what was expected and what was generally desired and it is to be hoped that this tardy agreement is the forerunner of the business of the port for the season rather than that foreshadowed by the stranding of the Yale.

One thing has been settled a second time and for the better. When the ore-handling rate was first fixed and placed higher than at other Lake Erie ports a protest was entered by certain influential men with the interest of the port at heart and they set about to straighten it out, not stopping till the rate was put on a level with the others, where it will doubtless stay. There is, of course, no canal rate and there may be none till the first arrivals of grain are scattered, as it usually happens that the east has waited for lake grain and wants it as soon as the railroads can bring it. The flat rate of 3 cents on wheat to New York for all ex-lake grain ought to bring a great amount here. It is the lowest ever made and was no doubt put in to head off the Welland and some other aggressive competitors. We are all well pleased when our route does such things, but are sad when it is some other one.

Lumber will be handled at the same rate as last season, on a basis of 32 cents on log-run pine, with the consignee paying 5 cents additional for straightening on the dock. If there is a pool the cost of grain elevation will be the same; if there is none it will be what one can get. Quite possibly this week will see the arrangement completed. Vessel owners generally say that they prefer a pool. Then business is steadier and on a more regular basis, besides nobody asks that the work be done for nothing. War means war, with no profit and poorer service.

It is expected that the coal shipping trade will be brisk, and already practically all local shippers have taken tonnage quite liberally. The rates are high, but the condition of the hard-coal trade is such that, rate and all, the outlook is better than it was a year ago. Although there is some reason just now for not considering the general lake outlook as good as it was a month ago, chiefly on account of the serious slackness of the lumber trade, still there must be a much greater change than is thought possible now to convince Buffalo that one of the biggest seasons, both locally and generally, is not ahead of us.

JOHN CHAMBERLIN.

## BUFFALO WILL CHARGE THE SAME AS OTHER PORTS.

At a meeting of the harbor and canal committee of the Buffalo Merchants' Exchange, held April 21, for the purpose of conferring with the managers of the ore docks of Buffalo about the charge for unloading ore at that port during the season of navigation of 1900, the committee was informed by the managers of the various docks that they had decided not to charge 25 cents a ton for unloading ore, but to reduce the charge to 22 cents, the same as at other ports on Lake Erie. The harbor and canal committee had been fearful that the extra charge of 3 cents a ton for unloading ore at Buffalo would result in diverting some ore from that port to other ports. The action of the dock managers in reducing the charge at Buffalo to the same price prevailing at the other ports on Lake Erie will prevent this diversion, and was therefore most gratifying to the authorities of the exchange.

The Case outward thrust propeller wheel, illustrated in an advertisement on page 23 of this issue, is certainly worthy of investigation from vessel men who are not acquainted with the claims that are made for it. As with everything else new, the makers of this wheel met with difficulties in the beginning, although fully confident of the merits of the wheel they were offering. But after a couple of years of stubborn effort they have succeeded in putting out full 300 of this type of wheel and they have letters from all over the country telling of its economy and smooth-running qualities.

Representative Southard has introduced a bill in the house of representatives to make Toledo a steamboat inspection service port. There are now three inspection ports in Ohio—Cleveland, Cincinnati and Gallopis.

## WAGES ON LAKE VESSELS.

If the wages of men aboard lake vessels, as fixed a few days ago at a meeting of the Lake Carriers' Association in Cleveland, were compared with the spring schedule of 1899 the increase would be of a very marked kind. But the vessel owners this year did not take the low beginning of last spring as a basis. They took up the closing schedule of 1899, which was the highest of the year, as the best wages are paid in the fall when freights are usually high and when there is most difficulty in getting men on account of unfavorable weather. Even the high schedule of last fall was increased in some cases. Firemen, wheelmen, oilers, seamen and lookouts are to be paid \$45 a month, instead of \$42.30 last fall. Wages of mates and cooks on tow barges are also increased somewhat over the fall schedule. A full comparison is made in the following table:

## WAGES OF MEN ON LAKE VESSELS.

ON STEAMERS.	CLOSE OF 1899.		OPENING OF 1900.	
	First class vessels.	Sec'nd class vessels.	First class vessels.	Sec'nd class vessels.
Chief engineers.....	\$132.00	\$114.00	\$132.00	\$114.00
Second engineers.....	90.00	84.00	90.00	84.00
First mates.....	96.00	84.00	96.00	84.00
Second mates.....	66.00	54.00	66.00	54.00
Cooks.....	66.00	60.50	66.00	60.00
Helpers to cooks.....	24.20	20.57	24.00	20.00
Firemen.....	42.35	42.35	45.00	45.00
Wheelmen.....	42.35	42.35	45.00	45.00
Lookouts.....	42.35	42.35	45.00	45.00
Oilers.....	42.35	.....	45.00	.....
Deck hands.....	24.20	24.20	25.00	25.00
ON CONSORTS AND SAILS.				
First mates.....	60.00	54.00	70.00	55.00
Second mates.....	48.00	.....	50.00	.....
Cooks.....	42.35	36.30	45.00	40.00
Seamen.....	42.35	36.30	45.00	45.00

## AROUND THE GREAT LAKES.

An expenditure of \$10,000 is to be made by the University of Michigan in providing for a school of marine engineering.

Capt. Edward McGowen, one of the early sailors of the lakes, died at his home in Port Huron a few days ago. He was seventy-four years of age.

The steamer Tampico, building at Craig's yard at Toledo for Mr. Arthur Hawgood and others of this city, will be launched Saturday afternoon.

R. C. Pennoyer of Bay City, and Thos. Prindiville of Chicago, have purchased the steamers Chas. Hebard and consorts Aloha and Annabel Wilson for \$85,000.

Major Hanbury, light-house engineer, Detroit, Mich., will open bids at noon May 18 for the construction of wharf, oil house, custodian's dwelling, etc., making up the light-house depot that is to be located on Sugar island, St. Mary's river.

As announced last week, the steamers Badger State and Empire State, which traded down the St. Lawrence last season, are to be operated in Buffalo-Green Bay service during the coming season under direction of M. J. McCormick of Green Bay. These vessels are owned by Cleveland parties.

The opening announcement card put out by Mr. Herman of the Cleveland & Buffalo Transit Co. is unusually attractive this season. It represents a girl with models of the fleet in either hand rising out of the petals of a lily. Daily trips, except Sunday, have been resumed. On and after May 27 trips will be made every day in the week.

An agreement regarding prices of steamboat fuel in Toledo was entered into a few days ago by John T. Solon, Herman & Sons, the Blair Coal Co., Harvey Williams and Bingham Bros., coal dealers at that port. The prices are: Hocking lump, \$2.50; run of mine, \$2.40; Massillon and Jackson lump, \$2.75; Massillon and Jackson run of mine, \$2.65.

The Donnelly Contracting Co. of Buffalo has secured two contracts for the extension of the breakwaters at Ashtabula and Lorain. The Ashtabula bid was \$410,292 and the Lorain bid \$635,519. This company now has on hand more than \$1,600,000 of United States government and state work, including harbor work at Fairport, Conneaut, Erie, Buffalo and Cape Vincent.

The new ore dock of the Eastern Minnesota Railway Co. on Allouez bay at Duluth is nearing completion. It will be ready to receive ore on May 1. The new dock has 250 pockets of 250 tons each. Trimmed the pockets will hold 266 tons each. The approach to the new dock is said to be the largest timber structure in the world. It is a mile long and for a distance of about 900 feet ranges from 70 to 73 feet high.

Following is a revised list of captains and engineers of steamers of the Northern line, Buffalo: North West, Capt. Geo. A. Miner; North Land, Capt. W. C. Brown; Northern King, Capt. J. M. Saunders; Northern Queen, Capt. J. F. Vaughn; North Wind, Capt. John Hartman; Northern Light, Capt. M. J. Haberer; North Star, Capt. F. G. Stewart. The engineers are John MacDonald, W. C. Lenfest, John A. O'Mara, A. T. Stewart, Thomas Jackman, John J. Darcy, John Dee and W. T. Pike.

## PNEUMATIC TOOLS AT THE EXPOSITION.

Mr. T. P. Kimman, assistant mechanical superintendent with the Standard Pneumatic Tool Co. of Chicago, has just sailed for Paris, in order to install and operate the "Little Giant" pneumatic tools and appliances at the Paris exposition. The Standard company will have a complete air plant in actual operation in the Champ de Mars and Park Vincennes, demonstrating the adaptability of pneumatic tools to various classes of work, and showing the development of this class of machinery. It will be a novel and interesting exhibit and one that will redound to the credit of America.



## THE FUTURE OF SHIP BUILDING.

BY CHARLES H. CRAMP.

(FROM HARPERS' WEEKLY, BY PERMISSION. COPYRIGHT, 1900).

The marvellous progress in ship building made by Germany during the past ten years gives us the key to the future of that industry in this country. Up to about twelve years ago, although there were two very considerable ship-owning companies in Germany, there was no ship building worth mentioning. All the sea-going ships of the Hamburg-American and North German Lloyd companies, and most of the German navy itself, such as it was, had been built in England. But about 1888 the policy of Germany was suddenly changed. The present German emperor promoted the new policy with all the vigor and ability so characteristic of him. He not only encouraged the German ship building industry by his administration of the laws, but he, through his private resources, personally took stock in most of the enterprises that were started under the impetus of the new policy, and he also interested himself in the same manner in the ships themselves.

The result is that today, including ships under construction and nearly finished, the Hamburg and the North German Lloyd are the greatest two ship-owning and ship-operating concerns in the world. And concurrently with that all the German war vessels for the last fifteen years have been built and are required by law to be built in Germany, and, as far as possible, of domestic material. And an additional result is that, from practically nothing twelve or fifteen years ago, Germany may now be considered as the second ship building nation in the world, and rapidly encroaching upon the hitherto undisputed supremacy of England. Had the policy of our government been as wise, as liberal, or as comprehensive as is the policy of the German government, the growth of the American ship building industry might have compared favorably during the past twenty years with that of the fatherland. It may be said that American ship building has grown rapidly since, say, 1881 or 1882. But consider what that growth might have been and might still be were our government to cease driving nails into the coffin of American ship building, and promote, aid and encourage the industry as other nations are doing. The subject of American ship building is, I think, little understood by the general public, and much that is written about it is inadequate to explain the situation.

In the first place, there seems to be a disposition to regard the supremacy of Great Britain in metal ship building as a cause, whereas it is an effect. It is the effect of two causes—(1) the destruction of the American merchant marine just at the beginning of the era of metal ships, and (2) the most persistent and universal aid and encouragement from the British government. It is not stating the case too strongly to say that the principal or largest ship yards in Great Britain have been built and equipped and their working organization trained at the public cost, or by public money. For convenience we may begin with the year 1860, from which to date the supremacy of metal ships. Since that time about or a little more than seven-tenths of the total steam tonnage, metal built has been the product of British ship yards. During the first ten or fifteen years of that period a very large proportion of the naval construction of Great Britain was given to private ship yards, and for that work prices were paid sufficiently large to not only give a handsome profit on the ships themselves, but to enable the builders to construct new dry docks and otherwise enlarge their plants and organizations. The most notable example of this kind is Laird's of Birkenhead, who were enabled, by the method described, to build five large dry docks. It is difficult to estimate or to even analyze in detail the benefits of this policy in all its bearings. The far-sightedness of the British government might well be cause for chagrin to the American people, who have seen the English nation build up an efficient reserve power that would enable it to quickly prepare for war, both in new construction and in the repairs and outfit of vessels that in time of peace would be what is called "lying in ordinary." But it had an effect reaching far beyond that. The ships which these private ship yards built for the British navy went all over the world and advertised their builders in a manner that could not have been accomplished by any other method. The result was that, from 1860 to 1890, British ship yards supplied all the nations of the world with navies wholly or in part, except France and the United States. The general result has been to make metal ship building the greatest of all British industries for a period of forty years; greater not only in point of commercial supremacy—or rather, it may almost be said, monopoly of ocean

carriage—but also in actual profit earned and money brought into the United Kingdom from all the rest of the world. There seems to be a tendency to forget these notorious facts.

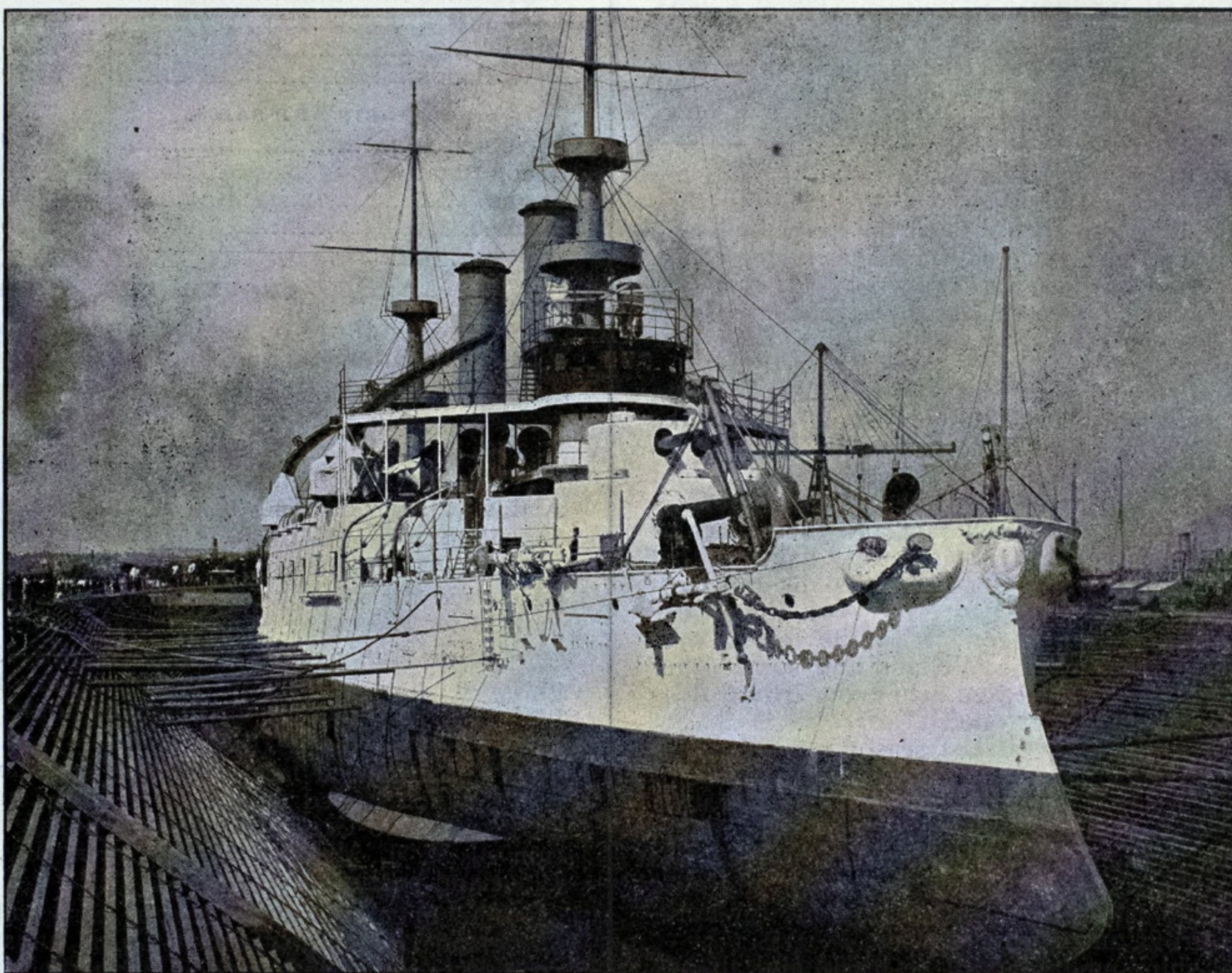
Now turn to American ship building and see the reverse side of the picture. Just at the time when the metal ship building supremacy began our supremacy in the era of the wooden ship ended. The war of the rebellion wiped out the commercial fleet that we had, which was composed almost entirely of wooden vessels, both sail and steam. Some of the ships were bought by our own government; others were destroyed by Confederate privateers; the remainder were transferred to foreign flags and put under foreign management in order to avoid capture. By the time the war ended the business of owning and operating ships in the United States had ceased to exist. No effort was made to resurrect it. There was no demand for new ships, because all the people who had previously owned and operated ships had gone out of the business, or their companies were disorganized or broken up by the war, and the English and, to a less extent, other foreigners had secured under their neutral flags during the war such a perfect monopoly of sea-carrying trade that nobody was willing to undertake a contest with them under the conditions then prevailing. Then, as if to stamp out the last spark

of life in American ship building, the government adopted the policy of doing what naval work it had to do in its own navy yards; therefore, so far as the seaboard was concerned, there was absolutely no demand for American-built ships except in the coasting trade, which, in these years, was done almost exclusively in old wooden hulks that had survived the war. So we have before us the two conditions—British ship building promoted, aided and encouraged by the most lavish system of government patronage on a most colossal scale, and American ship building choked to death by the reaction of the same causes that had promoted that of Great Britain.

Now what is the country losing by this backwardness of its ship building industries? Before I go into details let me state that no country can successfully own and operate ships that cannot build them. This

proposition has been disputed, and it has been argued that it made no difference how or where ships were obtained, the possession of them would create and maintain a merchant marine, irrespective of home ship building. But it is hardly worth while to waste time in refuting this fallacy. Assuming it to be admitted that it is desirable to maintain home ship building in an effective and prosperous condition, I will pass on to explain the part which the American ship builder must play in any genuine and permanent revival of our merchant marine. The only sure guide to practical truth is the lessons of history, or, in one word, experience. We see that Great Britain, the greatest ship-owning nation in existence, is also the greatest ship building nation in existence. She has reached a point at which her yearly imports exceed her exports by the enormous sum of \$780,000,000. To meet this deficit Great Britain must either earn an equal amount as the great common carrier of the rest of the world, or she must treat her accumulated cash capital itself as revenue and draw on her hoarded principal. Let us see how Great Britain makes up for her vast adverse balance of trade by her earnings as the common carrier of the world. Her 7,310,000 tons of steam merchant shipping earns annually \$500,000,000; her sailing fleet \$130,000,000, and the profits on banking, commissions and insurance, all of which inevitably follow the flag, amount to \$68,200,000—a grand total of \$698,200,000. This alone nearly wipes out the adverse balance previously shown as between actual imports and exports. Of this colossal revenue, greater than that of any empire that ever existed, the United States contributes a little more than two-fifths directly; or, in other words, the producers and consumers of the United States pay to British ship owners not less than \$280,000,000 a year as the common carriers of their commerce to and from all parts of the world.

Without a merchant marine of their own the American people must continue to pay this tribute indefinitely. For this drain there is no recompense. It is sheer loss. The foreign ship owner who carries our over-sea commerce makes us pay the freight both ways. For our exports we get the foreign market price less the freight. For our imports we pay the foreign market price plus the freight. The remedy is in the hands of congress. American-built ships of any grade or class must cost from 15 per cent. to 20 or 25 per cent. more than British-built vessels, ton for



Battleship Kentucky in Dry Dock.



ton of registry and class for class of rating. Manifestly, therefore, no person in any business whose product costs him at the rate of one and a quarter can compete with any other person in the same line of industry whose product costs him at the rate of only one. This perfectly simple and altogether fundamental fact renders absurd all efforts to argue that the ship building industry could exist in the United States if exposed without let or hindrance to the competition of British ship building in its own market. If America is to keep at home some part at least of the millions sucked out of this country by foreign ship owners and ship builders the ship-owning and ship building industries must be protected and encouraged here as they are in Great Britain and Germany. Struggling as the American ship builder is, under the conditions of dearer labor and greater exactions of material and workmanship as compared with foreign competitors, it is absolutely necessary that the policy adopted by the two nations I have referred to should be adopted by our government. Only in that way can the drain of American gold which flows into English pockets through her monopoly, of our ocean transportation be stopped.

#### AUTOMATIC BAND RIP SAW.

A new machine patented Feb. 27, 1900, and just brought out by the Egan Co. of 325-345 West Front street, Cincinnati, is illustrated on this page. It is what is known as their new automatic band rip saw.

This machine will do the work of several circular rip saws and is much safer to operate, as there is no danger of the material being thrown back and striking the operator. The saw blade is very thin and removes only a slight kerf, which is quite an item in ripping fine lumber. It saws 1 or 9 inches thick and requires little power, and the adjustments are made very rapidly. The column is very heavy, cored and perfectly free from vibration. The table is of ample size, always level and has at the front a plainly stamped index. The straining device is new and sensitive and has a forward, backward and side adjustment. The feed is very powerful and both feeding-in and feeding-out rolls being placed close together, short stock can be worked to advantage.

Altogether this machine is full of improvements, and will be found to possess numerous devices and conveniences not heretofore introduced into any rip saw placed on the market. The manufacturers will willingly furnish prices and full particulars if requested and will deem it a favor if the Marine Review is mentioned in the inquiry.

#### TALKING TOOLS TO ENGLISHMEN.

The Institution of Mechanical Engineers and the Institution of Civil Engineers of Great Britain are planning a reception for the members of the American Society of Mechanical Engineers, who will visit England shortly. The Institution of Mechanical Engineers has arranged to hold its next meeting in London during the last week of June and the grand hall of the Hotel Cecil has been engaged for the annual dinner on June 27. The last meeting of this organization was devoted to a discussion of pneumatic tools and power hammers. Among members taking part in the discussion were Mr. Simpson of Pimlico, Mr. Ivatt, superintendent of the Great Northern railway works at Doncaster; Mr. John Fielding of Gloucester, Mr. B. Martell of Lloyd's Register, Mr. Marriner, Mr. Alfred Hanson of Messrs. Shone & Ault, and Mr. J. W. Duntley, president of the New Taite Howard Pneumatic Tool Co. of London, and also president of the Chicago Pneumatic Tool Co. of this country.

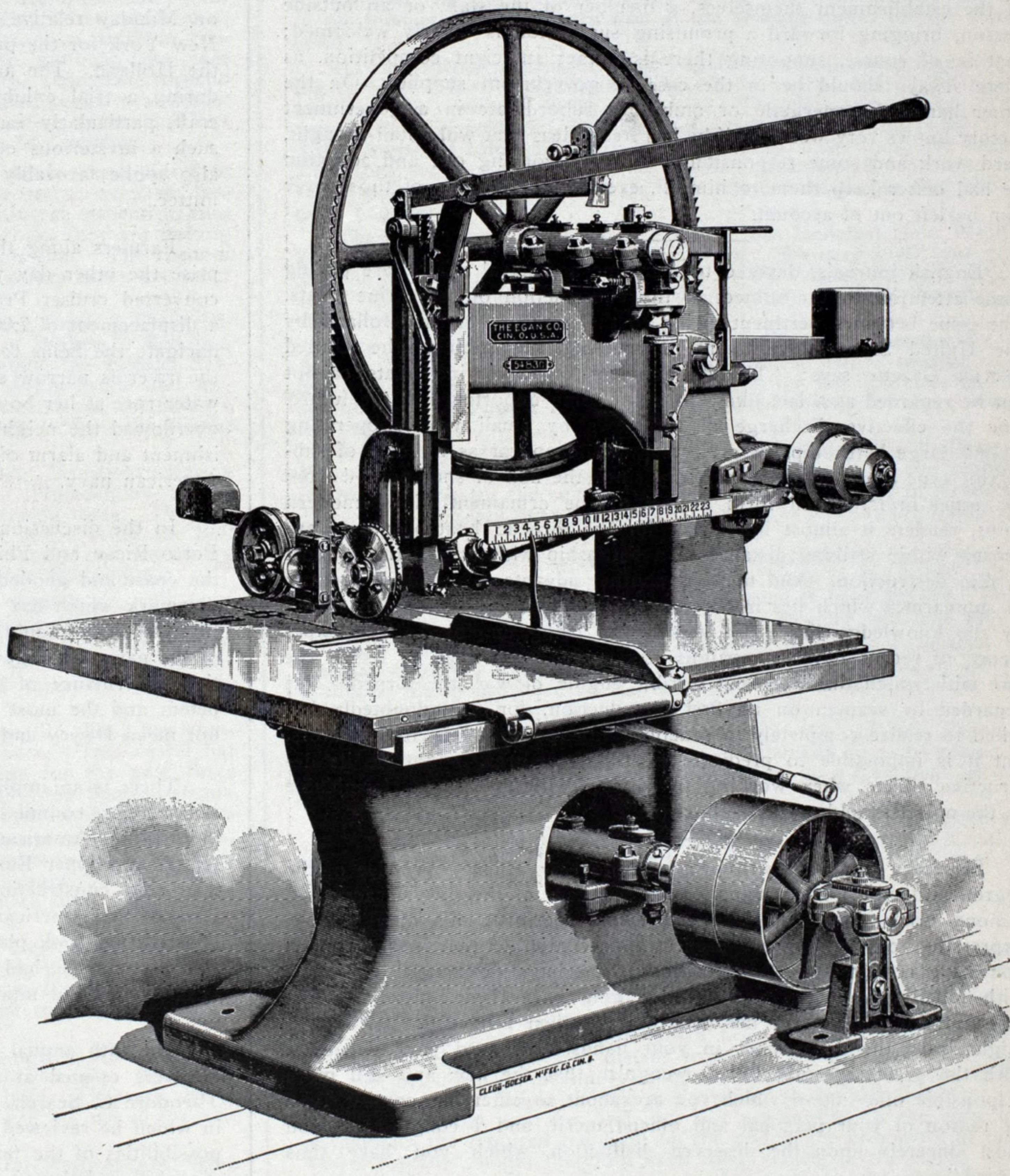
Mr. Duntley in his remarks said that he had been making pneumatic tools for five years past. Perhaps the best idea of the popularity of the tools in the United States might be gained, he said, from his company's output. During the first year they were in business they made 100 machines all told. Last year they averaged 800 per month. At the present time they were building new works and expected to double their production. By aid of these tools the Messrs. Cramp of Philadelphia had been able to overcome the results of a strike of 7,000 men, and in one ship they had just built all the rivets were closed by pneumatic machinery. As a consequence the Messrs. Cramp had given a duplicate order for the pneumatic machines. As a proof of the superiority of pneumatic riveting it was stated that the rivets were  $\frac{1}{8}$  inch longer than those used in hand riveting, and this additional metal had to be closed into the holes, thus showing that the latter were better filled by the use of the pneumatic riveter than by the hand hammer. Another proof was in the cutting up of work. With ordinary hand riveting, if the ends of the rivets were cut off, the shank would fall out from the holes in the plates, but when the rivets had been closed by the pneumatic machine they had to be driven out. The speaker himself was not a skilled operator, but in a contest in Germany he had beaten the hydraulic riveter. Ninety-seven per cent. of the railroads in the United States were using these tools, and the speaker gave a large number of instances in which air machines were superseding hand work. In the United States government ship yards they used the pneumatic hammer for scaling ships and it was found to be a great improvement on the old method. Another use for pneumatic machinery was in breaking up iron or steel vessels. They had what was called a "biter" or "nibbler," which chewed off the heads of the rivets in place of cutting them by chisel and hammer. New uses

were constantly being found for compressed air. He had seen a freight car painted by compressed air in seven minutes. In this country we were in a position to appreciate what had already been done in America in the introduction of compressed air machinery. It was not always easy to get a new thing introduced, and it might be interesting to state that he had worked two years with the Cramps before he could persuade them to give him an order.

Mr. Churchward of Swindon said he would like to ask Mr. Duntley a question as to the stay bolt biter. They had had one at Swindon for some time, but could not get it to work. The claw would not take hold for some reason. Mr. Duntley in reply said that the action of this machine depended on the shape of the claws, and this again depended on the nature of the work to be done. The claw must be so arranged as to bite in. Mr. Duntley further stated that he was about to proceed to Russia to arrange for a large installation of pneumatic machinery in that country, and on his return he would be pleased to go down to Swindon and put the machine right. Mr. Churchward further remarked that he did not wish it to be understood that he made any complaint, as the pneumatic machines did their work well, and whatever repairs might be needed were well paid for in the total result.

#### PNEUMATIC TOOLS IN GREAT BRITAIN.

Experience with pneumatic tools has been collected for one of the British technical institutions, and Messrs. Stephen of Linthouse, who were one of the first to apply this form of riveting plant, state that the calking pneumatic hammer does as much work as five or six men with ordinary tools, and the work is better done. Messrs. Penman, the Glasgow boilermakers, state that the tools do the work of three men, and Messrs. Mehan & Sons that they do "the work of three skilled hand calkers." The tools are more generally applied in locomotive works, and one report states that seventy  $\frac{7}{8}$ -inch rivets can be driven per hour per riveter, while sixty stay rivets, with 120 heads, have been put in per



AUTOMATIC BAND RIP SAW—THE EGAN CO., CINCINNATI.

hour per riveter. In drilling it takes 36 seconds to pass the tap right through the inside and outside plates in the front boxes of the locomotive, as compared with 108 seconds with the ordinary flexible shaft system. Drilling an ordinary  $\frac{7}{8}$ -inch hole takes 22 seconds, as compared with 4 minutes by the ordinary flexible shaft and 10 minutes by the ratchet brace. These results, representative of many, are valuable, because they are from disinterested workers, and collated by the Institution of Mechanical Engineers.



# MARINE REVIEW

Devoted to the Merchant Marine, the Navy, Ship Building, and Kindred Interests.

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The armor plate controversy has reached Great Britain and the fighting out of the issue in congress has been watched with great interest. The English journals are usually sound on economic points. They take the view that the establishment of a plant by the government, meaning of course, Great Britain, would be folly. "No doubt," says Engineering, "a government factory would produce in a leisurely manner excellent armor of ten or fifteen years antiquity. There is in England no need for a government armor plate factory. The private firms are quite willing to find all the money and enterprise needed for keeping up the supply if they are given reasonable encouragement. To those who are acquainted with the manner in which government factories are managed it needs no recital of examples to show that they move out of established grooves only under the influence of great external pressure. With the incentive toward gain the proprietors of private works are ready to adopt suggestions that will place them ahead of their rivals; and therefore, putting aside the labors of the proprietors of the establishment themselves, a member of the staff, or an outside person, bringing forward a promising suggestion is eagerly welcomed; that is, of course, supposing there is always sufficient competition, as there always should be in the case of government supplies. On the other hand, the energetic or ambitious subordinate in a government factory knows very well that if he has fresh ideas that will entail thought, hard work and some responsibility in their working out and adoption he had better keep them to himself, even if the jealousy of those over him be left out of account."

English journals, devoted to maritime and naval affairs, are paying some attention to the subject of the construction of submarine boats. The issue becomes pertinent owing to the purchase of the Holland by the United States government. Discussing the subject, the United Service Gazette says: "The development of submarine boats cannot but be regarded as a fact likely to be of some importance in the future. For the effective discharge of torpedoes by small vessels operating against large battleships or cruisers it would appear as if boats of submarine type are absolutely necessary since the hail of shot poured from the quick-firers, which form a part of the armament of all modern ships, renders it almost impossible for the torpedo boat proper to approach within striking distance of a battleship without courting almost certain destruction. And there is another advantage attending the use of submarines which lies in the moral effect produced upon the enemy by the knowledge that such vessels are being employed. The experience of recent naval campaigns has tended somewhat to lessen the awe with which that new and terrible engine of war, the torpedo, was regarded by seamen on its first introduction, for it undoubtedly has failed to realize completely in practice the expectations of its inventors, but it is impossible to predicate exactly how great might be its destructive effects when working in concert with an ally so formidable as the noiseless and unseen submarine."

Secretary Long has written a letter to Gov. Allen expressive of the regret with which his resignation as secretary of the navy is accepted. Among other things he says: "I cannot perform this duty without expressing to you the very highest appreciation of the services which you have rendered in that position. You have discharged its duties with unfailing courtesy and ability. You have been more than an assistant, for there never has been a time when I have not felt that I might leave the department in your hands. I regard your departure with the greatest regret but I recognize that the new and still more responsible office upon which you are about to enter has come to you by reason of your personal and official merit, and I congratulate you most sincerely upon the deserved distinction which you have thus earned."

The first and second days of May have been set aside by the house of representatives for the consideration of the Nicaraguan canal measure. It is extremely unlikely that this measure will be passed during the present session of congress. The subject is in altogether too chaotic a state for intelligent action. The sincerest advocates of the construction of the canal are those who are opposing the present measure. A considerable force of surveyors and engineers are now working in the isthmus under the supervision of the Nicaraguan commission. They

have been at work for six months and cannot possibly formulate their report during the present session. The sum of \$1,000,000 was set aside for the preparation of this report upon routes; and yet the advocates of the present measure do not want to wait for it. They are enemies rather than friends of the canal project. It would be better to await the report of the commission than to blindly appropriate \$140,000,000 for the construction of the canal without any definite program as to where it is to be built. The canal is primarily a commercial enterprise. Its chief purpose is to shorten the distance between the Atlantic coast and the Orient and consequently to reduce freights. It seems like a waste of men and money to build a fortified waterway. Its use in warfare can safely be left for the future to decide; the present necessity is a commercial highway.

The appointment of Mr. Frank H. Hackett as the assistant secretary of the navy to succeed Charles H. Allen is one of the rareties of modern politics—the office seeking the man. He is peculiarly adapted to the important duties of this office. His war record is excellent. He entered the navy in 1852 as acting paymaster and served throughout the war, being with Lieut. Com. Flusser when he was killed on the U. S. S. Miami in the engagement with the ram Albemarle at Plymouth, N. C. For the last quarter of a century he has practiced law in Washington. He accepted the appointment with the understanding that his term of office should expire on March 4 next. He cannot afford to give any further time to the office. The appointment came as a complete surprise to him.

Admiral Dewey, accompanied by his aid, Lieut. Caldwell, and Rear Admiral Hichborn were heard by the house committee on naval affairs on Monday relative to the resolution of Representative Cummings of New York for the purchase of a number of submarine boats similar to the Holland. The admiral told of his recent observations of the boat during a trial exhibition and he expressed approval of this type of craft, particularly for coast defense purposes and for the moral effect such a mysterious engine of warfare would exert. Admiral Hichborn also spoke favorably of the craft. No action was taken by the committee.

Farmers along the river banks near Rouen were treated to a surprise the other day which they will not forget during a lifetime. The converted cruiser Prairie carrying exhibits to the Paris exposition has a displacement of 7,000 tons and it was decided to see if she could not navigate the Seine to Rouen. She did. Notwithstanding the fact that the river is narrow she maintained a speed of 15 knots an hour. The water rose at her bow in a solid wall and the wash was so great that it overflowed the neighboring gardens and vineyards to the great astonishment and alarm of the farmers. It was their first introduction to the American navy.

In the discussion of the question as to whether the survey of the Porto Rican and Philippine waters should be made by the navy or by the coast and geodetic survey, Representative Cannon of Illinois made a remark which has kept him busy explaining ever since. He insisted that the work should be done by the coast survey, claiming that officers of the navy were educated to fight and not to perform civil duties. "In the performance of civil duties," he said, "they are the most incompetent and the most expensive." Now he has been saying that he did not mean Dewey and had not the admiral in mind at all when he spoke.

There is an implied compliment in the fact that Kaiser Wilhelm II is sending a commission of German naval architects to this country to inquire into American methods of ship building. Since the days of the American clipper European nations have cast envious eyes upon American ship construction. No lines were ever more beautiful than the lines of the American sailing vessel. The great revolution in warship construction took place in the United States and nearly every innovation of note has had its inception in this country. The German commission will find much of interest in the United States.

The fifth annual convention of the National Association of Manufacturers opened at Boston, April 24. The address of the president, Theodore C. Search, was a most exhaustive and most admirable paper in which he reviewed the industrial development of the country and the possibilities of the future. He devoted particular attention to the shipping bill and the efforts which had been put forth to shape a wise and beneficent measure.

The International Longshoremen's Association has issued a well-bound and attractive little pamphlet under the title "The Finish of the Stevedore-Saloon-Bossism of the Port of Buffalo." It details the report of the committee to the Lake Carriers' Association while in convention in Detroit in January last and also before the committee on grain handling in Cleveland. The directness of the statement shows that the longshoremen are acquiring business methods.



## NEWS FROM BOTH COASTS.

EVERYWHERE IS TO BE NOTED INCREASING ACTIVITY—NEW MACHINERY WANTED IN SEVERAL PLACES—AN ERA OF SHIP CONSTRUCTION.

Work on the new plant of the New York Ship Building Co. at Camden, N. J., is progressing rapidly. The land purchased for the ship yard includes a tract of some 120 acres with a water frontage along the Delaware river of 3,500 feet, having a constant depth of water at low tide of 40 feet. The main office building, built of red brick and trimmed with stone, is already finished. The yard is filled with piles of lumber, carloads of structural steel, cranes and derricks and everything indicates a works of enormous proportions. The superintending captain of the yard, W. G. Randle, who was formerly commodore of the International Navigation Co.'s fleet, said a few days ago: "We are not yet ready to make a statement regarding progress on our plant nor to fix any day when ship building will be commenced. All sorts of rumors have managed to get into circulation, but none of these statements, and, indeed, no statement of any kind regarding the works is official. Few of those which have been started by people who think they know more about our business than we do have the slightest particle of truth in them, and not one of them is correct in essential details. In possibly two or three months we will be ready to make an official statement which will have some interest to the public, but in the meantime we propose to keep our own councils and we do not care to take the curious and the obtrusive into our confidence. Garbled and incomplete newspaper stories will probably continue to appear, but these we cannot hope to avoid, and we do not propose to pay any attention to them. The whole truth is we are building a ship yard, and when it is finished it will be time enough to talk about it."

The Foster Engineering Co. of Newark, N. J., is about to build a new factory. It will be a three-story brick building, 75 feet wide and 300 feet deep. The company manufactures principally regulators of steam pressure. It is at present working on an order for the Danish navy and it has fitted out a large number of vessels of the United States navy with these devices, among them nine battleships, including three under construction, the armored cruisers New York and Brooklyn, thirteen protected cruisers, fourteen gunboats, one dynamite gunboat, the ram Katahdin, three monitors, nine torpedo boats and the submarine torpedo boat Plunger. The revenue cutter service uses these regulators almost exclusively. The company also supplies manufacturing plants and has just made a large valve for the Krupp gun works in Germany.

Roach's ship yard at Chester, Pa., is giving steady employment to from 1,200 to 1,500 men. In the boiler shop they are at work on two large boilers for the steamer Mount Hope; also several cement-making machines and a large sugar tank. In the engine works they are putting out an engine for a new boat for the Old Dominion Line. The steamer Jamestown is being completely overhauled. The auxiliary screw schooner Enterprise is also undergoing a general refitting.

Land purchased for the ship yard of the Eastern Dock & Construction Co. at Quincy, Mass., includes the property of Walter S. Redding, the Bryant Adams farm, part of the Bosworth estate, the Ezekiel Sargent estate, the W. P. Pinell estate, the Marcus Wight estate and several small lots. The property has over a mile of water front, including a long stretch of channel where there is water enough to float the largest battleship.

The Jackson & Sharp Co., Wilmington, Del., is constructing a steamboat for the Barrett Manufacturing Co. of Philadelphia to ply between Philadelphia and Boston in the coal-tar carrying trade. The vessel is to be 185 feet long, 34 feet wide and 13 feet deep. After the hull is constructed it will be towed to Philadelphia, where the machinery will be fitted by the Neafie & Levy Ship & Engine Building Co.

The bureau of supplies and accounts, navy department, will open bids on May 1 for the following supplies for the Mare Island navy yard: 88,500 pounds of rivets of various sizes; steel plates, tees and elbows; one 4,000 pound steam hammer; one 90 inch spur and worm cutting machine; six portable reversible, piston breast and screw-fed pneumatic drills for boat builders' use.

The Merrill-Stevens Engineering Co., Jacksonville, Fla., has completed the extensive rebuilding of the steamer Cocoa. This vessel has been in the hands of machinists and shipwrights for the past three months. The Cocoa is of 1,214 tons and was formerly the Spanish steamship Argonauta, which was captured during the Spanish-American war.

Work toward the completion of the torpedo boats and destroyers at the ship yard of the William R. Trigg Co. at Richmond, Va., is being pushed rapidly. It is expected that the job of changing the machinery of the submarine torpedo boat Plunger from steam to some other motive power will be done within a very few months.

Machine tools have been purchased by the New York Air Compressor Co., which will double the capacity of their new Arlington (N. J.) plant. The company has been awarded contracts for four duplex air compressors, one of which will go to Mexico, one to England and the other two to factories in this country.

William E. Woodall & Co. of Baltimore have now in frame a handy three-masted schooner of 400 tons capacity on light draught. She is 120 feet in length, 29 feet beam and 8½ feet depth in hold. They are also at work on a new car float for the Southern Railway Co., for use in the harbor of Norfolk.

West Shore ferries of the New York Central Railway are being equipped with electric lights, steam steering gear and other modern improvements. The Buffalo has already been fitted and the Newburg, Kingston, Albany, Oswego, Chapin and Midland will follow shortly.

John K. Cowen is the name of a new tug 110 feet long just being completed by the R. M. Spedden Co., Baltimore, for Baltimore & Ohio railway service in New York harbor. The Spedden company is to build another tug of the same size for the Baltimore & Ohio.

The William Skinner & Sons Ship Building & Dry Dock Co. of Baltimore, Md., has in frame the first of five cargo lighters to be built for the Baltimore & Ohio railway. Each will be 80 feet long, 28 feet beam and 8 feet depth of hold.

C. & R. Poillon, foot of Court street, Brooklyn, have ready for launching the new schooner yacht Kirin, built for Max Agassiz. She is 98 feet over all, 70 feet water line, 18 feet beam, 11 feet 9 inches deep and 11½ feet draught.

Two vessels are under construction in Phippsburg, Me. C. V. Minott & Son have the keel stretched for a four-masted schooner and Frank Bowker has the keel stretched and several frames up for a three-masted schooner.

The president has signed the act which allows \$20,000 more for the construction of the lightship at Portland, Me. As the bill now stands \$90,000 is appropriated for the purpose.

J. S. Beacham & Bros., Baltimore, are building a light-draught schooner for the coasting trade. Her dimensions are: Length, 135 feet; beam 26½ feet; depth of hold, 8½ feet.

Capt. Clark of Kennebunkport, Me., has received the contract to build the hull of a ferryboat for the Portsmouth, Kittery & York street railway.

Some fifteen steam yachts are lying in the Gas Engine & Power Co.'s basin at Morris Heights, New York, awaiting orders to refit for the season.

William E. Woodall & Co. of Baltimore are building a three-masted center board schooner 120 feet long.

The Bath Iron Works, Bath, Me., will launch the new monitor Connecticut about May 1.

## PACIFIC COAST NOTES.

John B. Hardy of Tacoma, Wash., has purchased the plant of the old Western Machine & Engine Co. and has enlarged it by the addition of a number of new and up-to-date tools. The main building is 50 by 130 feet. It is located directly upon the dock with the Northern Pacific railway at the rear and deep water in front. A spur track runs upon the dock under a 100-ton marine shear, operated by steam. Mr. Hardy is making arrangements to build hulls both of steel and wood, but has been delayed in getting machinery. This part of the plant will be located on the tide flats about a mile outside of the city. Mr. Hardy was one of the bidders for the construction of the revenue cutter for the Pacific coast.

As an evidence of prosperity on Puget sound it is noted that according to custom house records there were built in that district during the past year 213 vessels of 10,658 gross tons. The class and tonnage of the vessels were as follows: Eighteen schooners, representing 4,685 tons; three sloops, 28 tons; five stern-wheel steamers, 1,050 tons; 162 barges, 3,709 tons; one yawl, 33 tons; one gasoline steamer, 13 tons; one iron screw steamer, 60 tons. All of these vessels are small, but they show a good beginning.

The steel twin screw steamer Kvichak was launched from Wolff & Zwicker's yard at Portland, Ore., last week. She is of 1,063 tons gross and 610 tons net register, and was built for the Alaska Packers' Association. She is designed to carry a large cargo on light draught and small coal consumption.

The Pacific Coast Steamship Co. will build a new steamer for the Alaska tourist trade. Its length will be 270 feet with a breadth of 40 feet. The steamer will have accommodations for 150 first-class and 250 second-class passengers. Bids will be solicited shortly for the construction of the boat.

A four-masted schooner, to be named Bainbridge, is building on Puget sound for Capt. Jensen, late of the Prussiac. A 700-ton schooner is also building on the sound for Hooper & Talbot of San Francisco. The keel will be laid for a 1,000-ton barkentine as soon as the Bainbridge is launched.

The transport Lawton is at the Union Iron Works, San Francisco, undergoing repairs. An improvement to be made in the vessel will be the installation of a refrigerating plant to cost at least \$25,000. Other improvements and repairs to be made to the steamer will cost \$40,000.

John Twigg & Sons of San Francisco have about finished the Thomas Crowley, a launch 45 feet long, 10 feet beam and of 4½ feet draught. She is propelled by the very latest style of three-cylinder Hercules gas engine of forty-five horse power.

It is reported that the Oceanic Steamship Co. of San Francisco will put new engines into the Mariposa or Alameda so as to enable the vessel to steam 17 knots and put her in service as a mail boat between San Francisco and Tahiti.

Dimensions of the Luzon, just launched from Hay & Wright's ship yard at Alameda point, Cal., are: Length over all, 188 feet; on deck, 170 feet; beam, 36 feet 6 inches; depth, 12 feet 6 inches. The cost was \$45,000.

## CRIB WORK AT BUFFALO.

Major T. W. Symons, corps of engineers, United States army, sends notice to vessel captains entering and clearing Buffalo harbor, warning them to exercise great care and take no chances during the present ice and fog conditions of running into the submerged cribs of the new Black Rock harbor, or north breakwater. The south end of this crib work is 1,300 feet distant from the Buffalo breakwater light and 600 feet north of the line joining the Buffalo light and the Buffalo breakwater light. While the ice is crowding shoreward the crib work is usually covered with ice, and it is not practicable for the contractor to maintain the required red light on the end of the crib work at night. Vessel captains should therefore keep their vessels in the center of the entrance channel and avoid being crowded over to the northward by the ice.

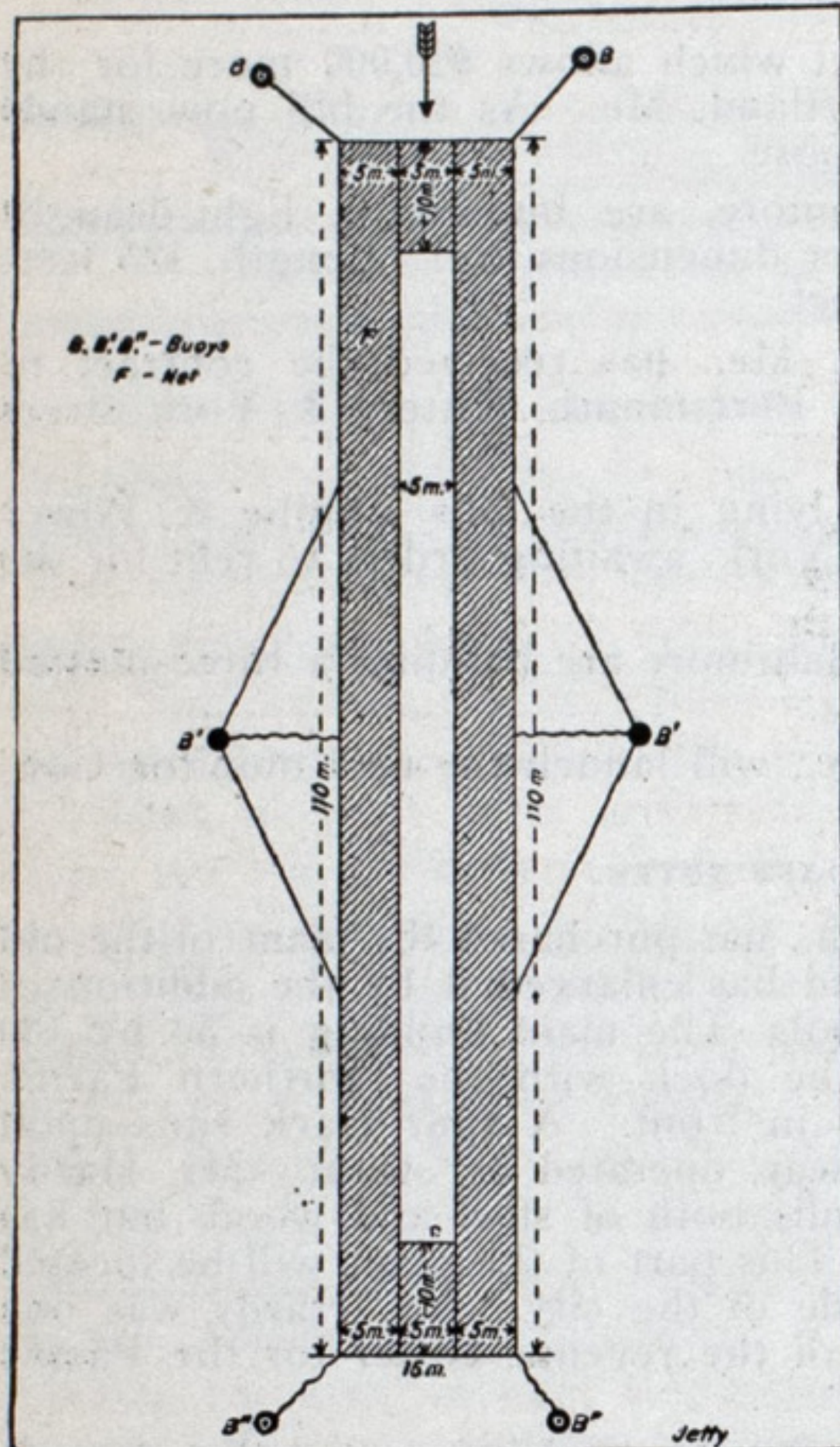
A notice was sent to vessel owners and captains in September last, warning them of the dangers and liabilities of vessels in case of collisions with these cribs, but the recent experience of the steamer Yale has demonstrated the importance of again reminding vessel captains of the existence of the crib work.

The torpedo boat Thornton will be launched at the ship yard of the William R. Trigg Co., Richmond, Va., on May 15. The relatives of Admiral Thornton of Boston are expected.



### DIMINISHING THE FORCE OF WAVES AND SURF.

According to a consular report an Italian gentleman, Baron Benvenuto d'Alessandro, living in Paris, 62 rue Bossiere, has invented a new method of protecting vessels at sea, entrances to harbors, light-houses, etc., from the force of waves and surf, which he claims is more efficient than the use of oil. His invention consists in retaining on the surface of the water an unsubmergible floating net by means of outriggers when



used to protect vessels in storms at sea, and by attaching it to buoys when used to protect light-houses, hydraulic works in construction, entrances to harbors, etc. He bases the idea of his invention upon the principle that in covering the surface of the sea with a thin, flexible, light and floating body of whatever nature, the part covered forms a crust under which the molecules of the imprisoned mass of water cannot move in the same manner as the surrounding body of uncovered water, the result being that even the most violent waves, upon reaching the edge of the crust, instead of climbing over it, of breaking or of destroying it, will pass under it as if there were a fall or difference of level, become flattened out, and lose much of their force.

The net used in the recent experiments at Havre was made of a thin hemp fiber, knitted in square meshes of 4 centimeters (1.57 inches), and afterwards waterproofed by the application of a solution of powdered cork and pure rubber. The material

of the finished net was 3 millimeters (0.12 inch) in thickness and light, weighing only 120 grams (4 1/4 ounces avoirdupois) per square meter (10.76 square feet). It was constructed by the Societe Industrielle de Telephones at Paris. The net was 110 meters (360.9 feet) long and 15 meters (49.2 feet) wide, made in four sections, securely fastened together. The two outside sections were 5 meters (16.4 feet) wide throughout the whole length of the net. The middle sections were also 5 meters (16.4 feet) wide, but extended only 10 meters (32.8 feet) from either end, leaving an open space in the center of the net 90 meters (295.27 feet) long and 5 meters (16.4 feet) wide. The inventor's reason for constructing the net with an open space in the center is that in his numerous experiments with the net made in this way, when used for the protection of entrances

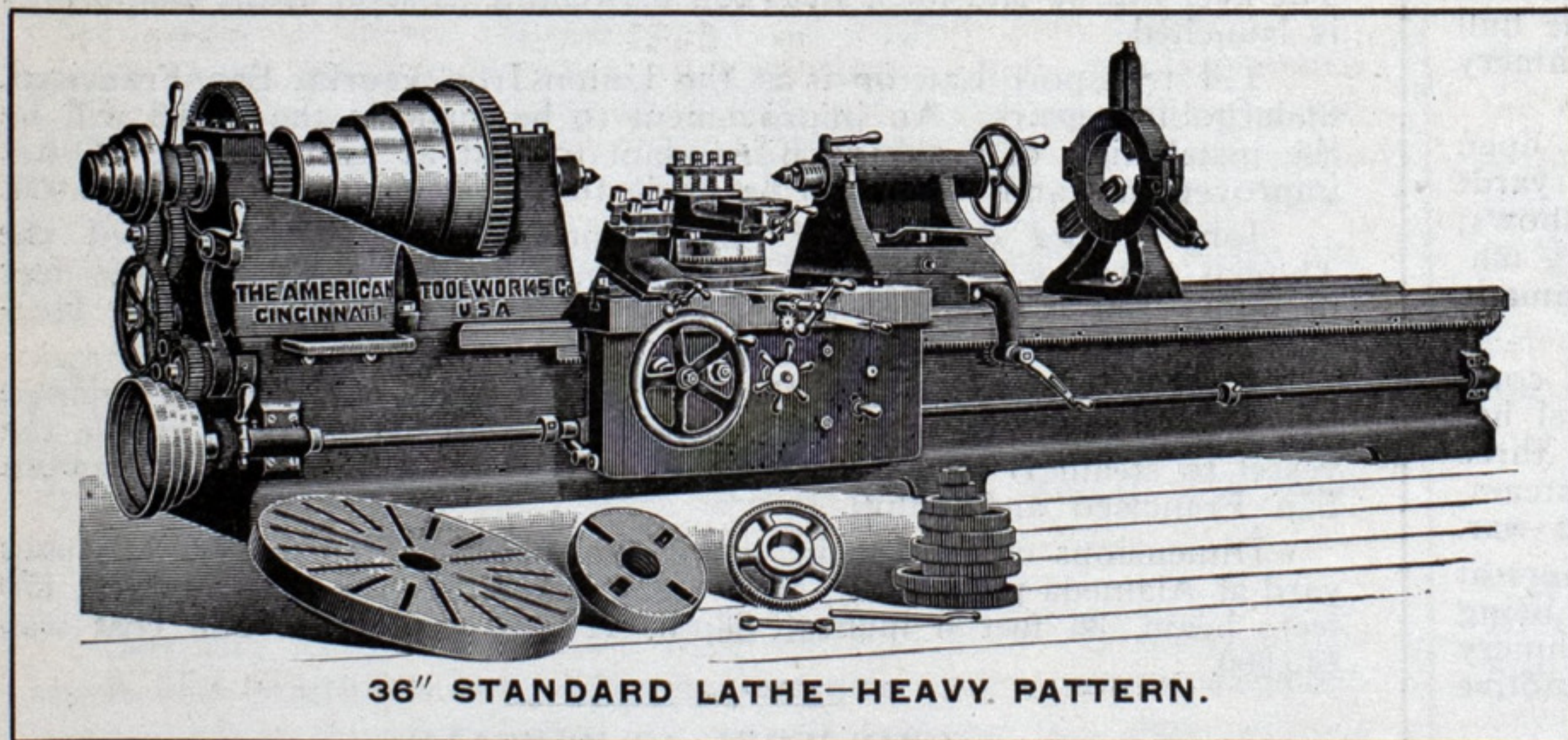
to harbors, etc., he found the surface of the water enclosed in the free spaces to be always calm, as if it were actually covered by the net. The net with the open space is only used when it is anchored. For the protection of vessels at sea the net is made solid.

The accompanying sketch shows the dimensions of the net and the arrangement of the buoys by which it was held in position. To illustrate the efficiency of the net in protecting hydraulic works in course of construction from the effects of a heavy surf, Baron d'Alessandro, about three weeks ago, placed his net off the middle of the north jetty of the new avant port at Havre, which is now finished for about 400 meters. The buoys BB were anchored in 50 feet of water, at high tide, in a position to secure the head of the net in the direction of the prevailing westerly winds and perpendicular to the jetty; the buoys B' B' being about 100 meters (328 feet) from it. At first only four buoys were used—BB and B' B'—but the anchors not being heavy enough to stand the force of the current, the buoys dragged, allowing the net to be slackened and take the form of a crescent. Afterwards, the buoys B' B' were added and the weight of the anchors increased. During a heavy westerly gale recently the net was held in position; but, on account of the seas hurling themselves against the jetty and breaking over it it was impossible to approach near enough to observe the effects which the net produced upon the portion of water protected. Mr. d'Alessandro is not discouraged by the unsatisfactory results of his experiments at Havre and intends in the near future to place his net in another position, in which, while being exposed to the heavy seas, it can be readily seen from the shore and its action judged. Other trials have been made of the floating net; in 1891 at Quiberon, Department of Morbihan, and in 1892 at Cherbourg.

The silver service which the citizens of Albany will present to the cruiser Albany will be a set finished in French gray, oxydized. The punch bowl will have a capacity of 48 pints. It stands on an abony base on which is a silver plate inscribed: "Presented to the cruiser Albany." On one side of the bowl is the Albany and on the opposite side the old Albany or U. S. S. Corvette, a two-masted sailing ship. The silver bowl rests on the ebony on standards formed of sturgeons. There are twenty-four goblets, a platter for roasts and game, two entree dishes, two oval jardiniere, a vegetable dish and two candelabras. In addition to the larger dishes there will be six round bon-bon dishes, six salts and salt spoons, six peppers and six vases, on all of which local symbolical decorations will prevail.

Great claims are made for a buoy invented by a Mr. Fletcher, an English engineer. The buoy contains a complete electric lighting installation—fully protected against the roughness of the waves and furnished with an electric lantern. As the buoy rides on the sea, the action of the waves, causing one portion of it to rise and fall continuously, sets a pump at work which throws a stream of water at high pressure onto a turbine. The turbine, revolving at a high rate, is connected to a dynamo which generates electricity, and thus it is claimed that at practically no cost, the beacon light is lit.

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MOSCOW: Alfred Stucken.



## NAVY PROJECTOR.

The Rushmore Dynamo Works of Jersey City, N. J., is furnishing over 100 projectors for the various ship builders on the coast, including nearly fifty of the navy type for the new war vessels under construction. A number of them have also been installed on many of the finest lake vessels. The firm is now shipping a fine 18-inch yacht projector to Fletcher Bros., Alpena, Mich., for the yacht Dungeness; also an 18-inch special pilot-house projector for the new passenger steamer Tashmoo, building at Detroit, and three others for steamers building by the Detroit Ship Building Co., as well as two 14-inch pilot-house projectors for the Arnold steamers at Cheboygan, Mich.



The illustration herewith shows one of the new Rushmore 18-inch 35-ampere navy standard projectors, being built for the torpedo boat destroyers and other vessels. These projectors are equipped with extremely efficient parabolic lenses, for the making of which the company has a most complete lens plant. The lenses are of uniform thickness and are thus very much lighter than the Mangin type. The cylinder of the light is fitted with sliding bearings, so that it may be readily balanced as required by the navy when used with the heavier Mangin lens. Each projector is supplied with a front door fitted with plain glass strips, and also an extra front door fitted with the navy standard diverging lens strips, which are also made in large quantities at the works. The lamp movement is the latest Rushmore positive feed type, and will feed the carbons both toward and away from each other, as required to keep the

arc absolutely constant at 50 volts, the variation under the most extreme conditions being less than one volt. In all other lamps heretofore used in the navy the carbons are separated a definite amount by a series magnet, and as they are consumed are fed together by a separate shunt magnet. Should the wind or a defect in the carbons cause a displacement of the arc, the old lamps always overfeed and the lamp goes out until the carbons are separated by hand. This defect may lead to disaster in

time of war, especially in the case of distant-control projectors. By pressing a small hand wheel into engagement, the automatic feed is thrown out of action and the lamp may be fed by hand, or the hand feed may be used in connection with the automatic feed. The cylinder is fitted with two dark glass peep sights, one in the side for observing the arc in horizontal plane and the other in the side of the top ventilator in connection with a prism for observing the arc in vertical plane. The turntable is mounted on roller bearings and moves very easily. There is provided a hand wheel for slow control vertical movement and another for slow horizontal control, these devices being readily locked in any position or instantly thrown out of engagement. There is a water-tight double-pole switch in the base. There is furnished a navy standard regulating rheostat for working on the 80-volt circuit with which the current may be varied from 20 to 35 amperes.

## NEW PROCESS OF TREATING TOOL STEEL.

Mr. H. F. J. Porter of the Bethlehem Steel Co., who is known to readers of the Review through his very interesting and instructive papers on steel forgings, was in Cleveland a few days ago. Mr. Porter is in the west at present in the interest of a new process of treating tool steels, which has recently been discovered at the Bethlehem works. This new process, which is known as the Taylor-White process, has developed some marvelous results, and it seems likely that its introduction into common use will revolutionize the machine shops of the world. It seems almost incredulous that a steel may be treated so that it will be harder when it is red hot than when it is cold, but according to Mr. Porter, this is a fact, and being the case, has allowed of the speeding up of the machine tools in the Bethlehem shops to four and five times their former capacity.

The Bethlehem Co. intends informing the world of this discovery at the Paris exposition, and they are now preparing an exhibit for that purpose. The introduction of the process in this section will be in the hands of Mr. Walter Miller, who has represented the Bethlehem Co. for several years.

Sealed proposals will be received at the office of the Light-House Engineer, Detroit, Mich., until 12 o'clock M., May 18, 1900, and then opened, for furnishing the materials and labor of all kinds necessary for the complete construction of the wharf, oil house, buoy shed, custodian's dwelling, barn, boat-house, fences and walks, and to do all necessary grading, for the light-house and buoy depot on Sugar Island, St. Mary's River, Mich., in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to Thos. H. Handbury, Major, Corps of Engineers, U. S. A. May 10.

# BELLEVILLE GENERATORS.

GRAND PRIZE AT THE WORLD'S FAIR OF 1889.

List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.

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Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCODILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGAUT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CHARNER**; Tug **ABERVRAC'H**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LEGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS**, **SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY**, **AMIRAL AUBE** and **MARSEILLAISE**.

MESSAGERIES MARITIMES: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH**, **AUSTRALIEN**, **POLYNESIEN**, **ARMAND-BEHIC**, **VILLE-DE-LACIOTAT**, **ERNEST-SIMONS**, **CHILI**, **CORDILLERE**, **LAOS**, **INDUS**, **TONKIN**, **ANNAM**, **ATLANTIQUE**.

COMPAGNIE DES CHEMINS DE FER DE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS**, **CAEN**, **BREST**, **CHERBOURG**; Fast Steamers **TAMISE**, **MANCHE**, **FRANCE**.

## RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **SVETLANA**; Cruiser **DIANA**; Cruiser **PULLADA**; Torpedo Transport Boat **BAKAN**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**.

## ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR**, **ARROGANT**, **FURIOUS**, **VINDICTIVE**, cruisers; **NIOBE**, **DIADEM**, **ANDROMEDA**, **EUROPA**, cruisers; **CANOPUS**, **GLORY**, **GOLIATH**, **ALBION**, **OCEAN**, iron clad ships; **ARGONAUT**, **ARIADNE**, **AMPHITRITE**, **SPARTIATE**, **HERMES**, **HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR**

and **ROSARIO**, sloops; **GRESSY**, **ABOUKIR**, **SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE**, **FORMIDABLE** and **IRRESISTIBLE**, **VENERABLE**, **LONDON**, **BULWARK**, iron clad ships; **EURYALUS**, **BACHANTE**, cruisers; **MUTINE**, **RINALDO**, **SHEARWATER**, sloops; **CORNWALLIS**, **DUNCAN**, **EXMOUTH**, **RUSSEL**, iron clad ships; **DRAKE**, **KING ALFRED**, **LEVIATHAN**, **AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX**, **KENT**, cruisers; **ALBEMARLE**, **MONTAGUE**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

## AUSTRIAN NAVY.

**BUDA-PEST**, iron clad coast guard; **KAISER KARL VI**, cruiser; **X'**, **X''**, battleships.

## ITALIAN NAVY.

**VARESE**, cruiser; **BENEDETTO BRIN**, battleship.

## ARGENTINE REPUBLIC.

**PUEYREDON**, cruiser; Steamships **PUERTO-HUERGO** and **MENDOZA**.

## SPANISH NAVY.

**REINA REGENTE**, cruiser.

## CHILIAN NAVY.

**O'HIGGINS**, cruiser; **ALMIRATE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **GENERAL BAQUEDANO**, school ship.

## JAPANESE NAVY.

**SHIKISHIMA**, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship.

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General Information Sent on Demand.



## TRADE NOTES.

The Lucas & Gliem Machine Works of Philadelphia, has just issued an attractive catalogue of its cold saw cutting off machines and general tools.

The King Bridge Co. closed a contract on Tuesday of this week to deliver immediately the structural steel for several new bridges for the Nickel Plate railway. The contract aggregates \$250,000.

The seventh annual oyster roast (always on an elaborate scale), given by the Berlin Iron Bridge Co. to its employees and their families, will take place at East Berlin, Conn., April 27. The invitation is a combination pen and ink and wash drawing printed in colors and is exceedingly tasty.

At the annual meeting of the Joseph Dixon Crucible Co. in Jersey City last week the following directors were elected: Edward F. C. Young, John A. Walker, Daniel T. Hoag, Richard Butler, William Murray, Alexander T. McGill and Joseph D. Bedle. The directors elected these officers: Edward F. C. Young, president; John A. Walker, vice-president and treasurer; George E. Long, secretary, and Joseph D. Bedle, counsel.

The Chelsea Clock Co., an old establishment of Boston that has made a specialty of yacht and marine clocks, issues a circular devoted to this branch of their work. "Our improved ship clock," they say, "is not a chronometer but a very high-grade lever clock movement, finely adjusted as to grade. It is a most attractive, fine time keeper, especially adapted to large yachts as well as ships." A striking ship's bell clock and a yacht or marine clock are also among this company's specialties.

**FERRO NICKEL MANGANESE FOR CUPOLA, CRUCIBLE** or ladle use is the only low-priced but high grade alloy that converts hard white iron into soft ductile steel castings; a sample keg, 100 pounds, shipped for trial to any responsible foundryman. Made from the Durango Iron Mountain high-grade nickel and manganese under Mexican patent by The National Ore & Reduction Co., Durango, Mexico. Stahlknecht y Cia., Bankers, sole agents for the Mexican Republic, Durango, Mexico. Howard Chemical Works, St. Louis, Mo., agents. May 3.

**BUSINESS CHANCE FOR A BUSINESS MAN** to establish a branch agency in New York for a new meritorious product manufactured under a patented process in France and Mexico, and endorsed and adopted by four foreign governments and twenty-eight railway companies abroad. United States Arsenal tests and reports now ready for publication, with many authoritative testimonials. The product has an enormous demand with positively no competition in the United States, and will be shipped on trial to any interested responsible party. Applicants are expected to furnish the very best of references, and to such exceptional inducements with credit, will be granted in the United States. An independent income for a competent business man. Wire us your intentions, and secure your territory at once. The National Ore & Reduction Co., Durango, Mexico. May 3.

## VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of April 25, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	41 1/4	42 1/2	40 3/8	41
American Steel & Wire, Pfd.....	79 3/4	79 7/8	79 1/2	79 1/2
Federal Steel .....	42	43 1/4	41 3/8	52 3/8
Federal Steel, Pfd.....	70 1/4	70 1/2	70 1/4	70 1/2
National Steel .....	36 1/2	36 1/2	35 3/4	35 3/4
National Steel, Pfd.....	91	.....	.....	91
American Tin Plate .....	28	28	27 3/4	27 3/4
American Tin Plate, Pfd.....	.....	.....	.....	.....
American Steel Hoop.....	28	28	27 1/2	27 1/2
American Steel Hoop, Pfd.....	74 3/8	.....	.....	74 3/8
Republic Iron & Steel .....	19	19	18 1/2	18 3/8
Republic Iron & Steel, Pfd.....	60 1/2	.....	.....	60 1/2



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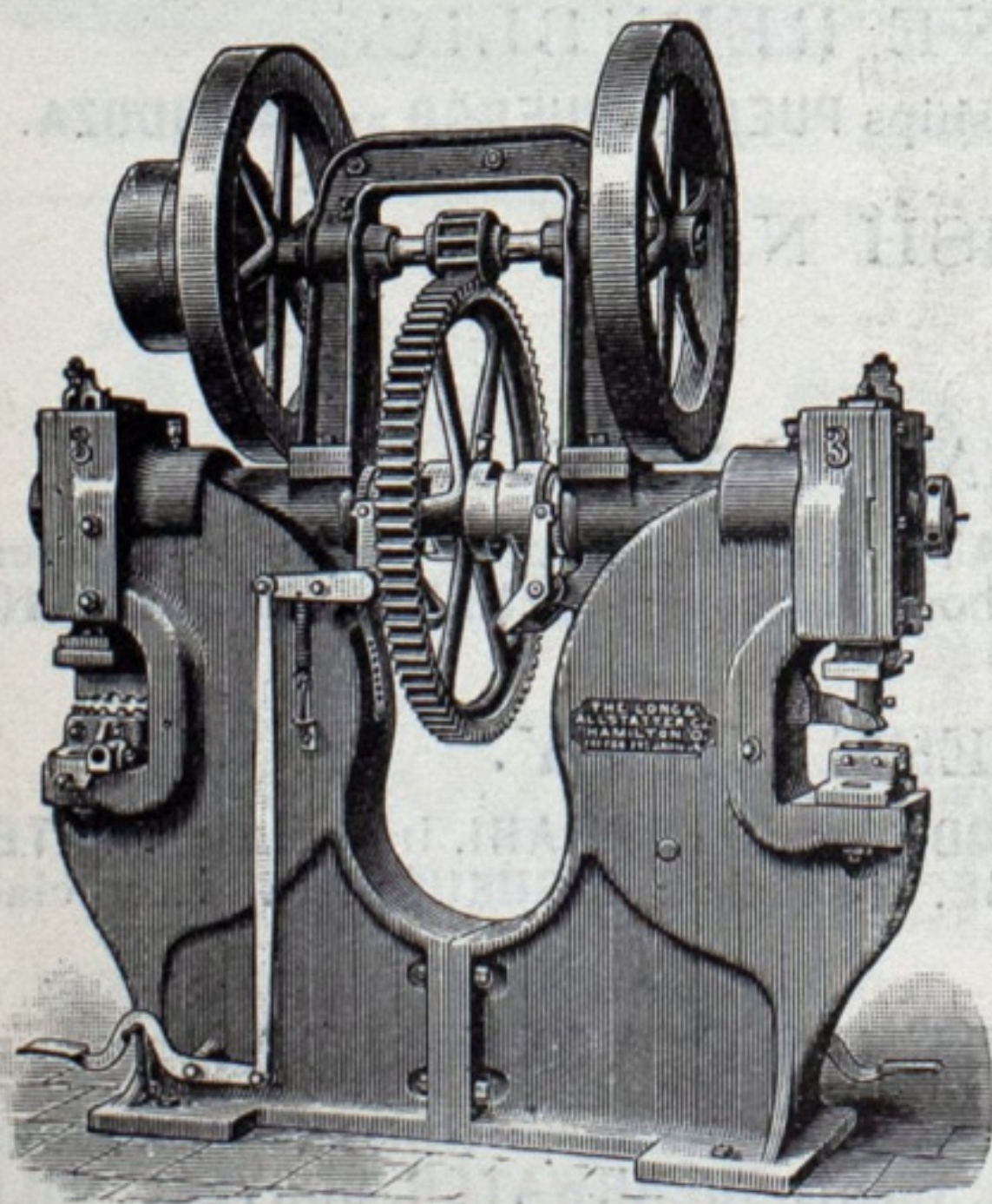
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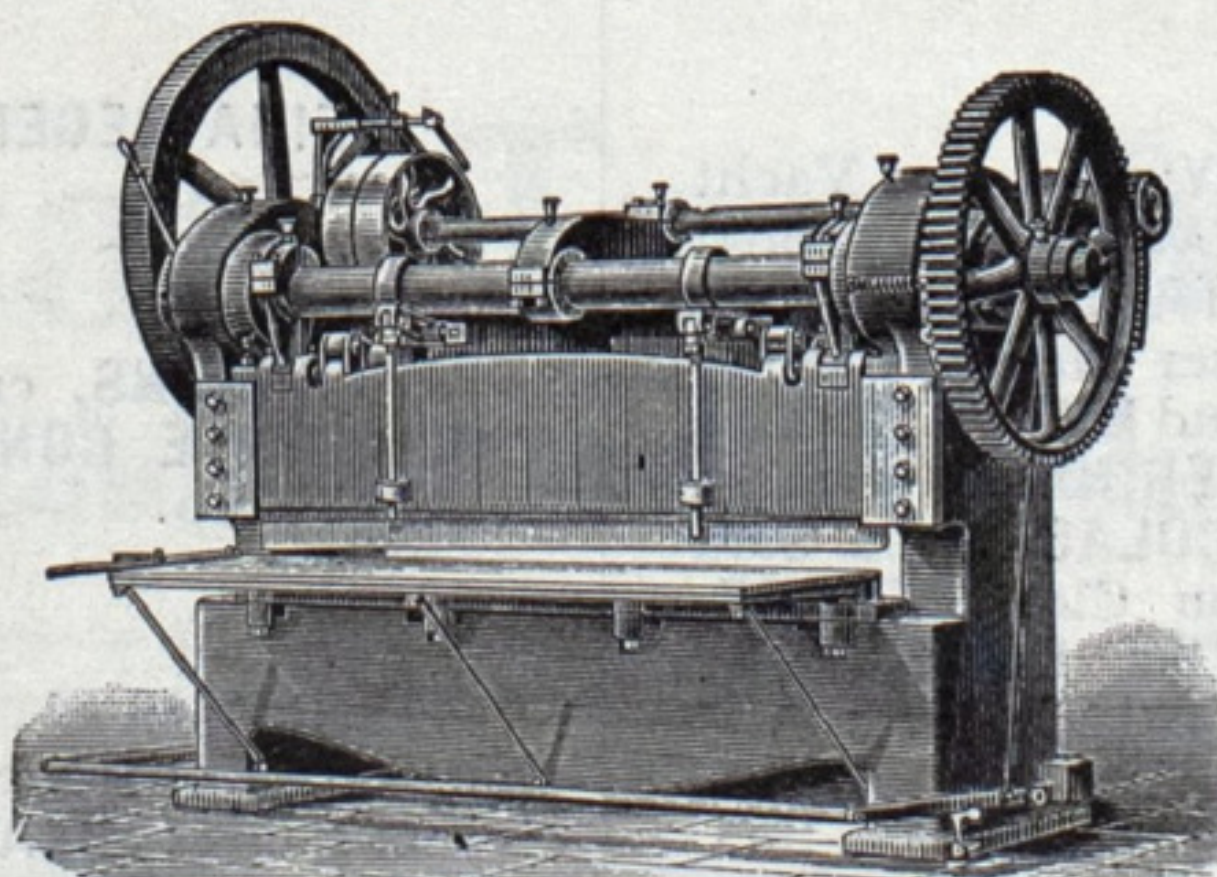
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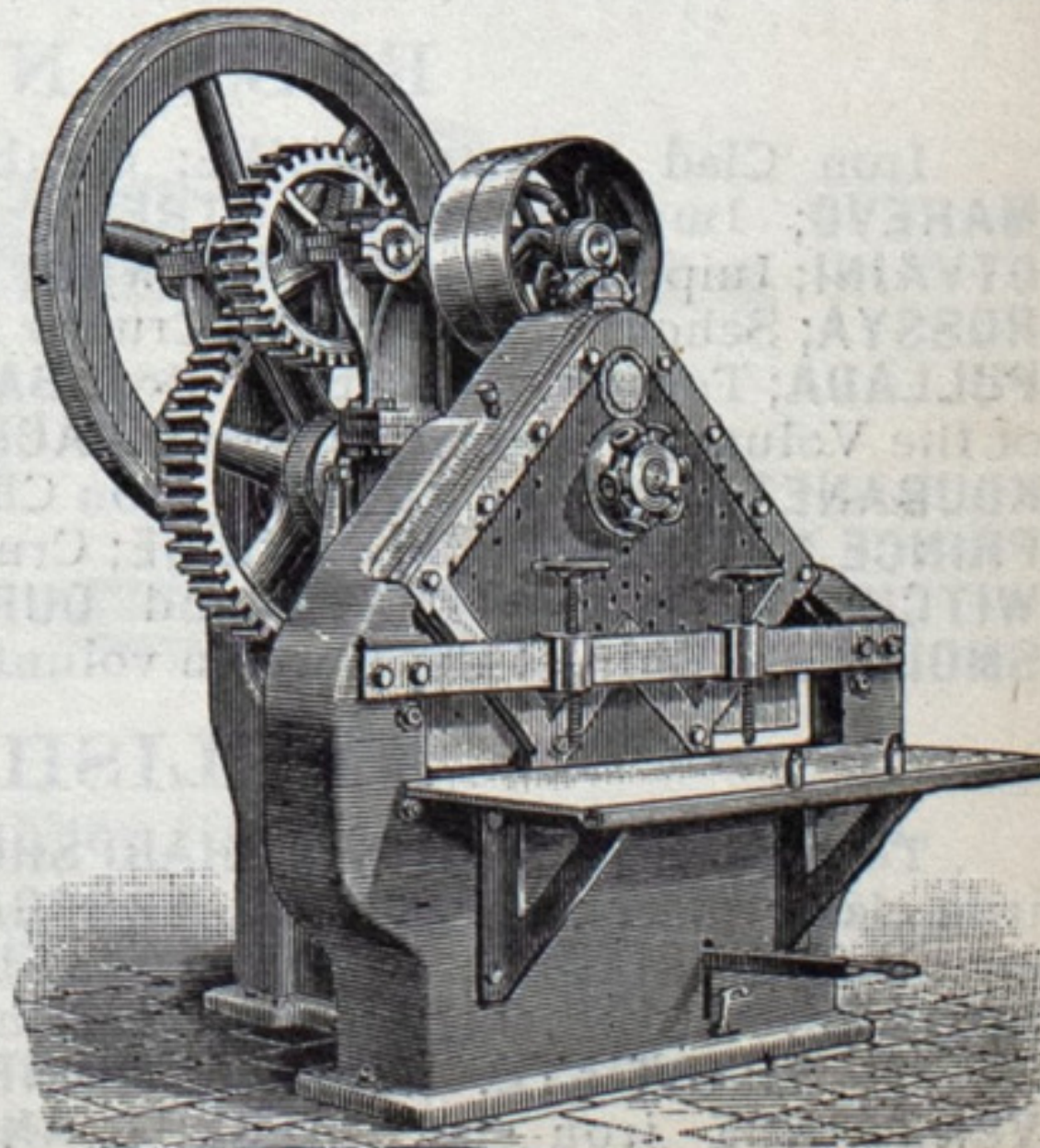
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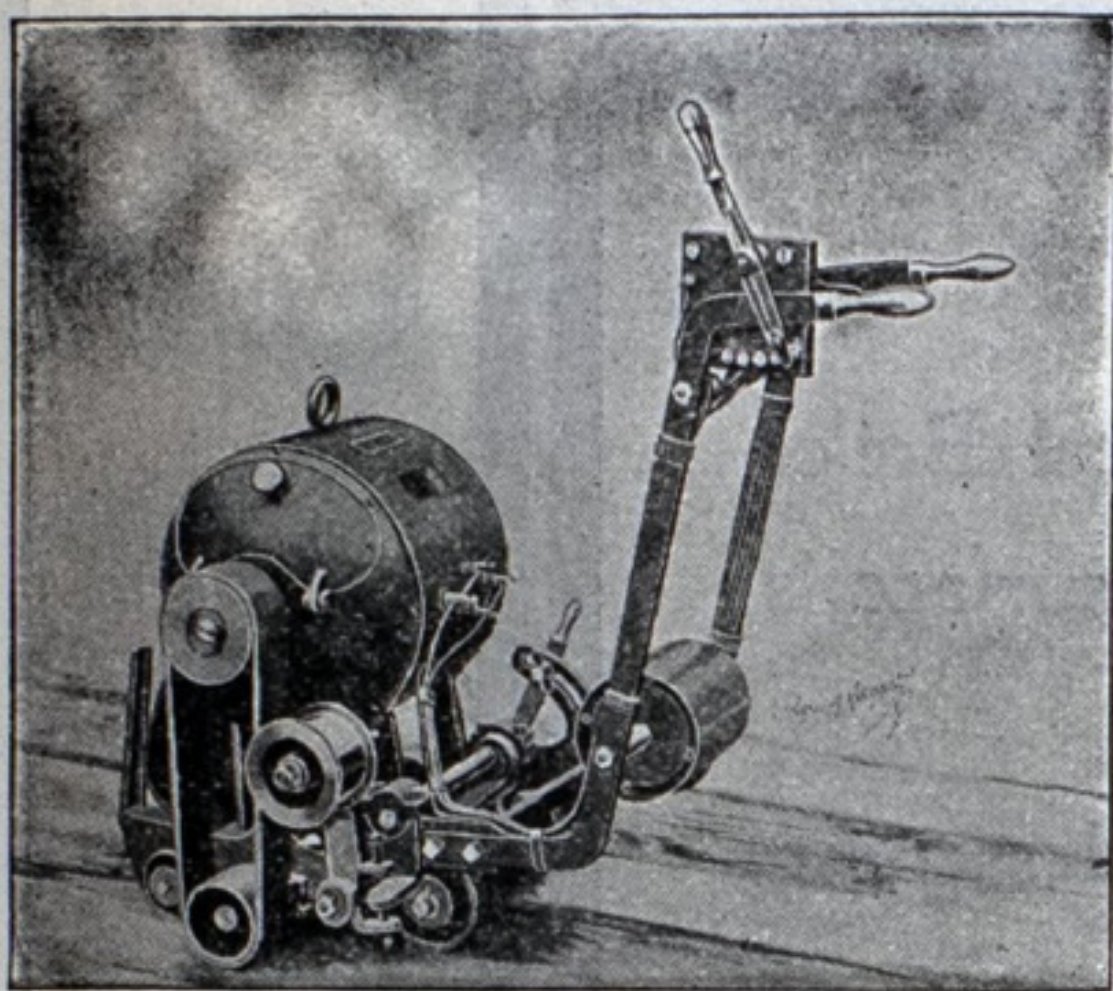


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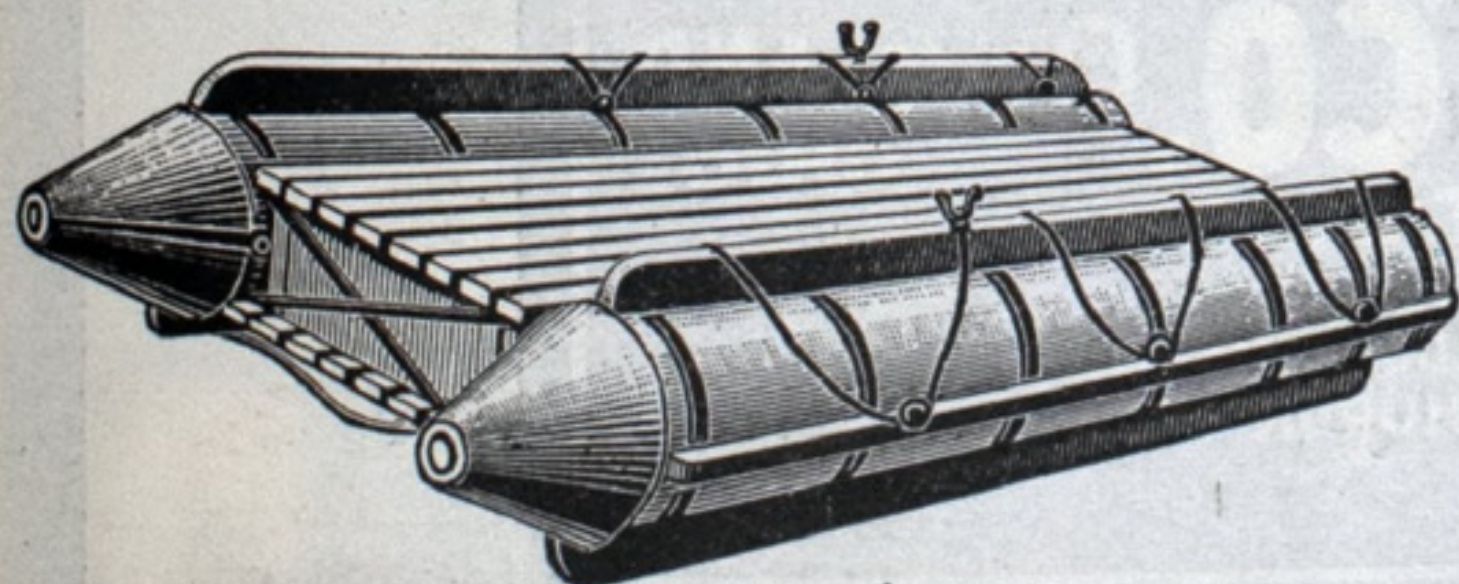
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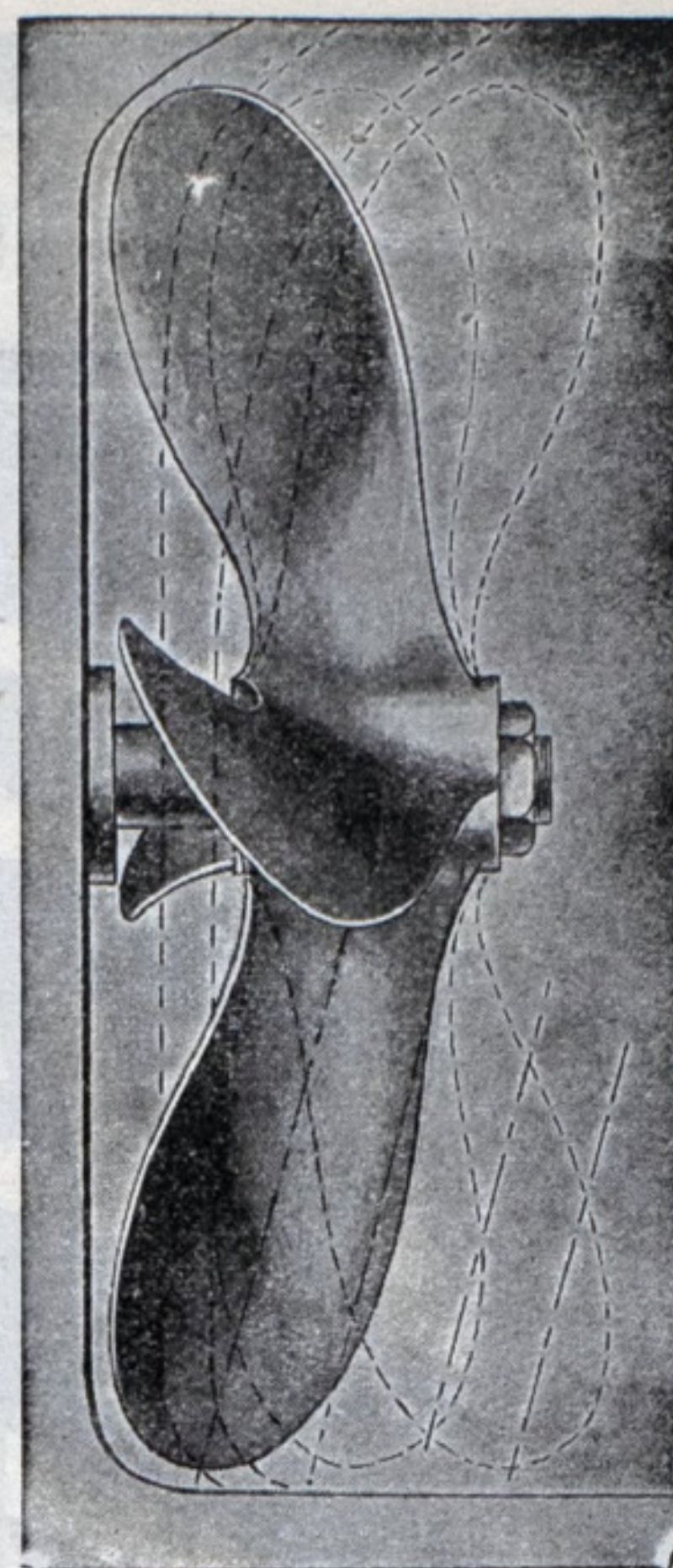
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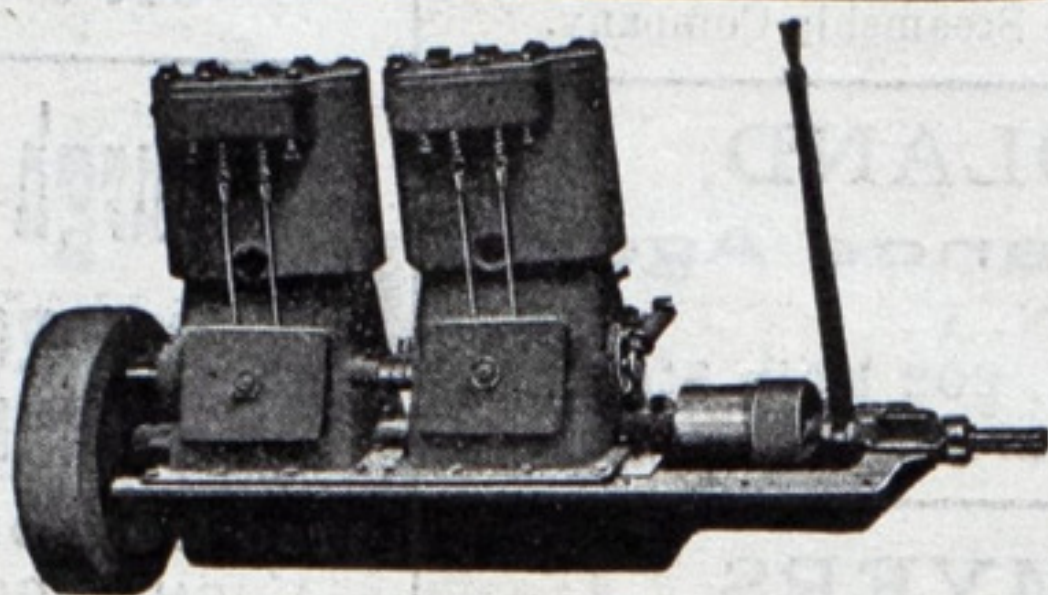
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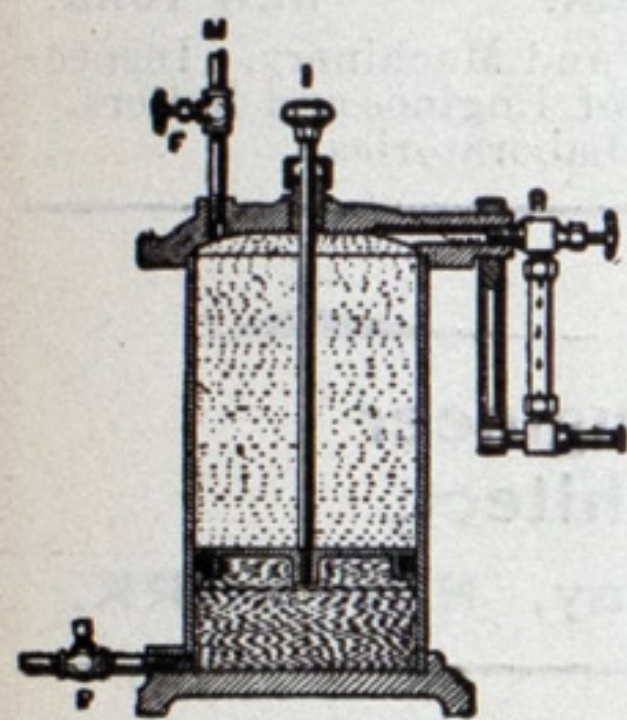
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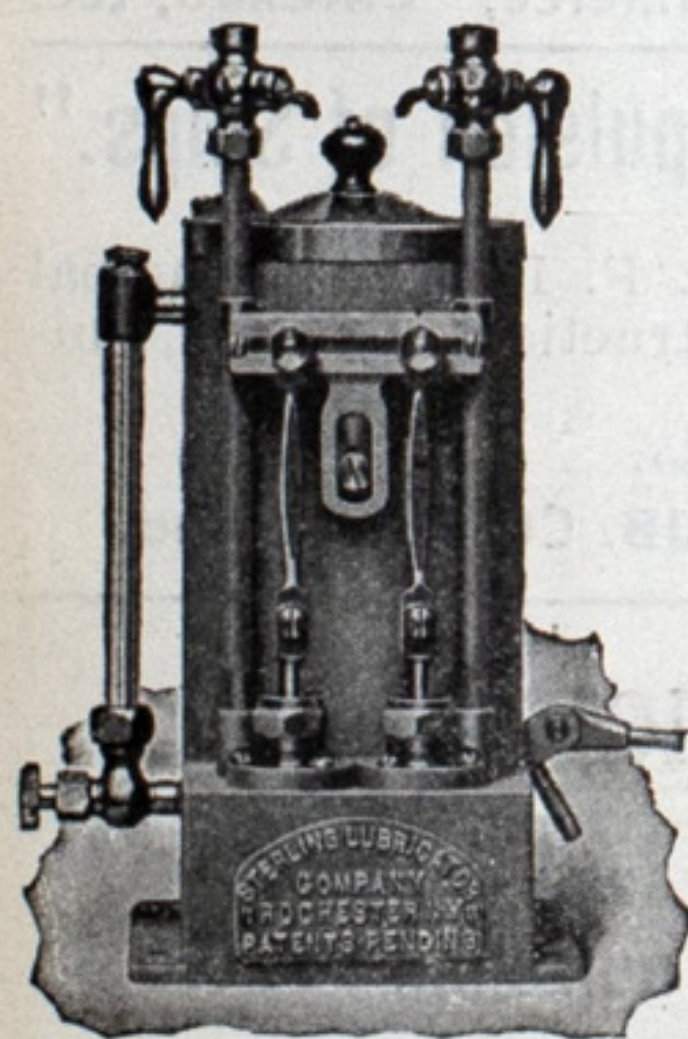
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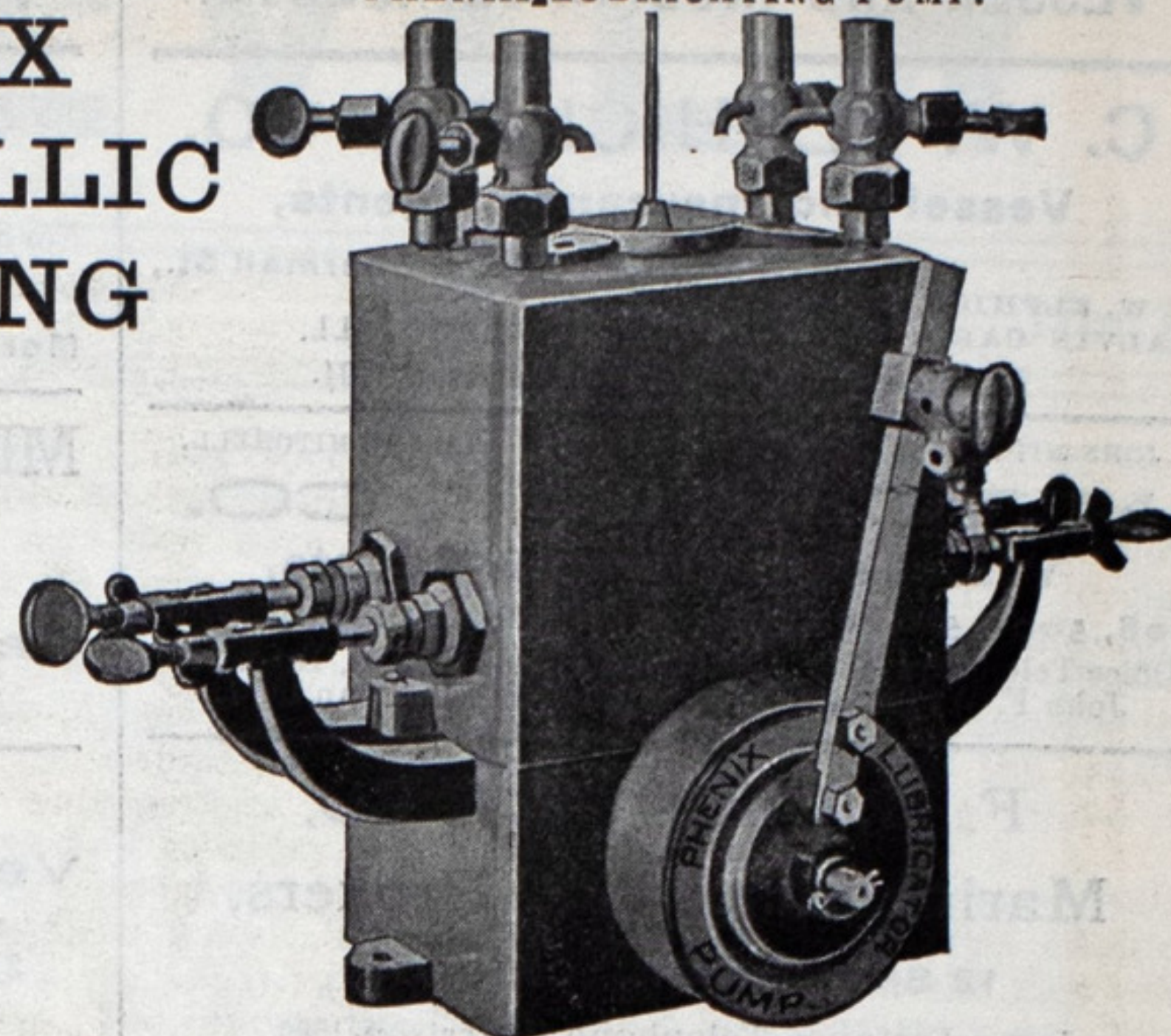
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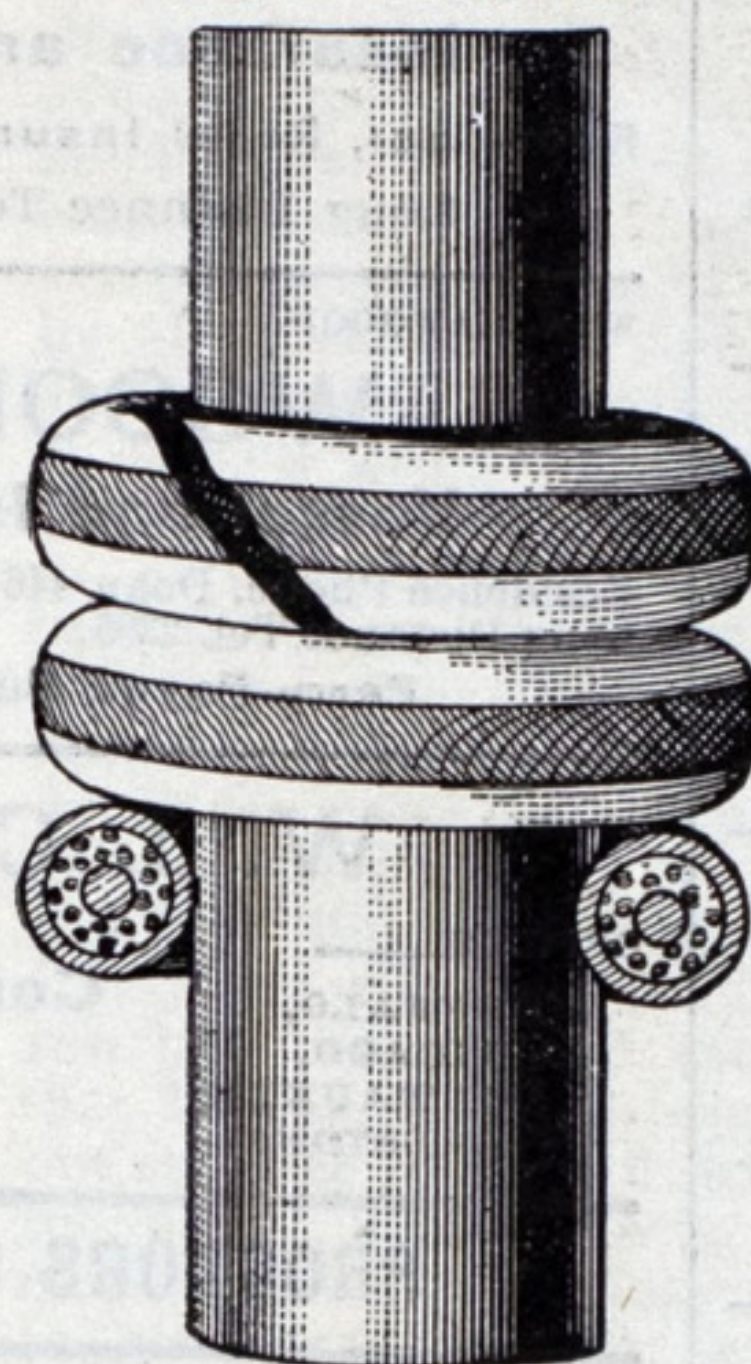
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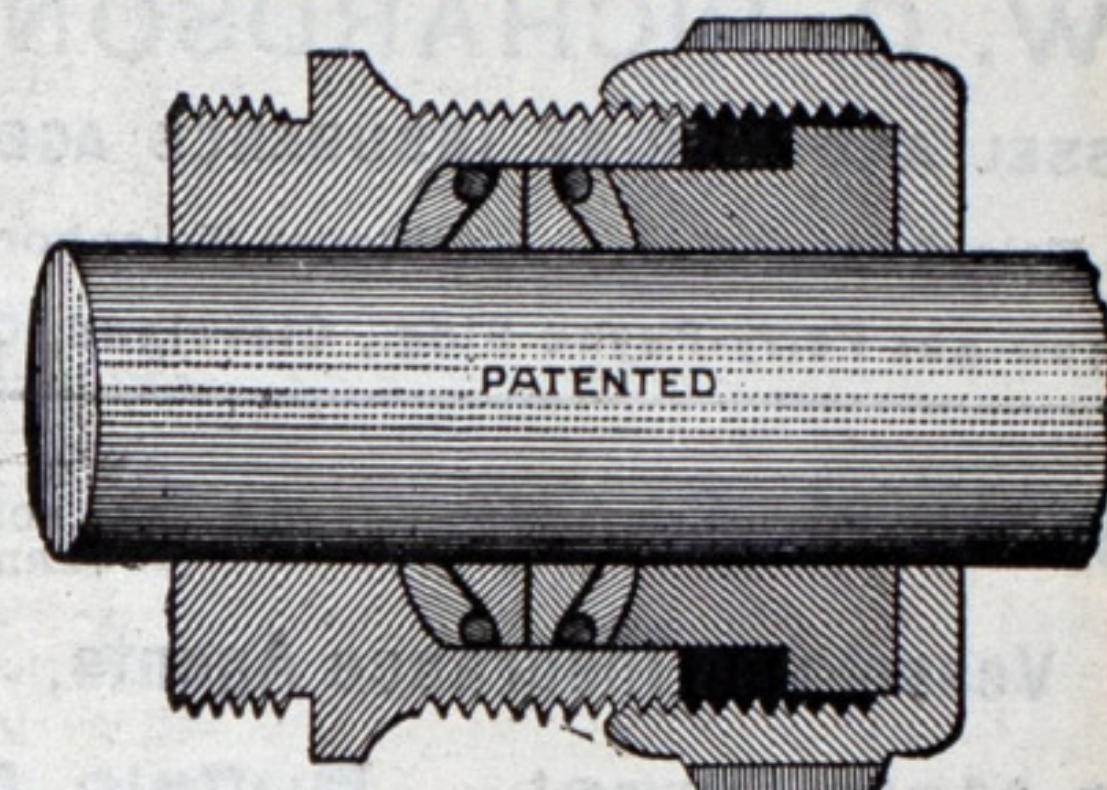
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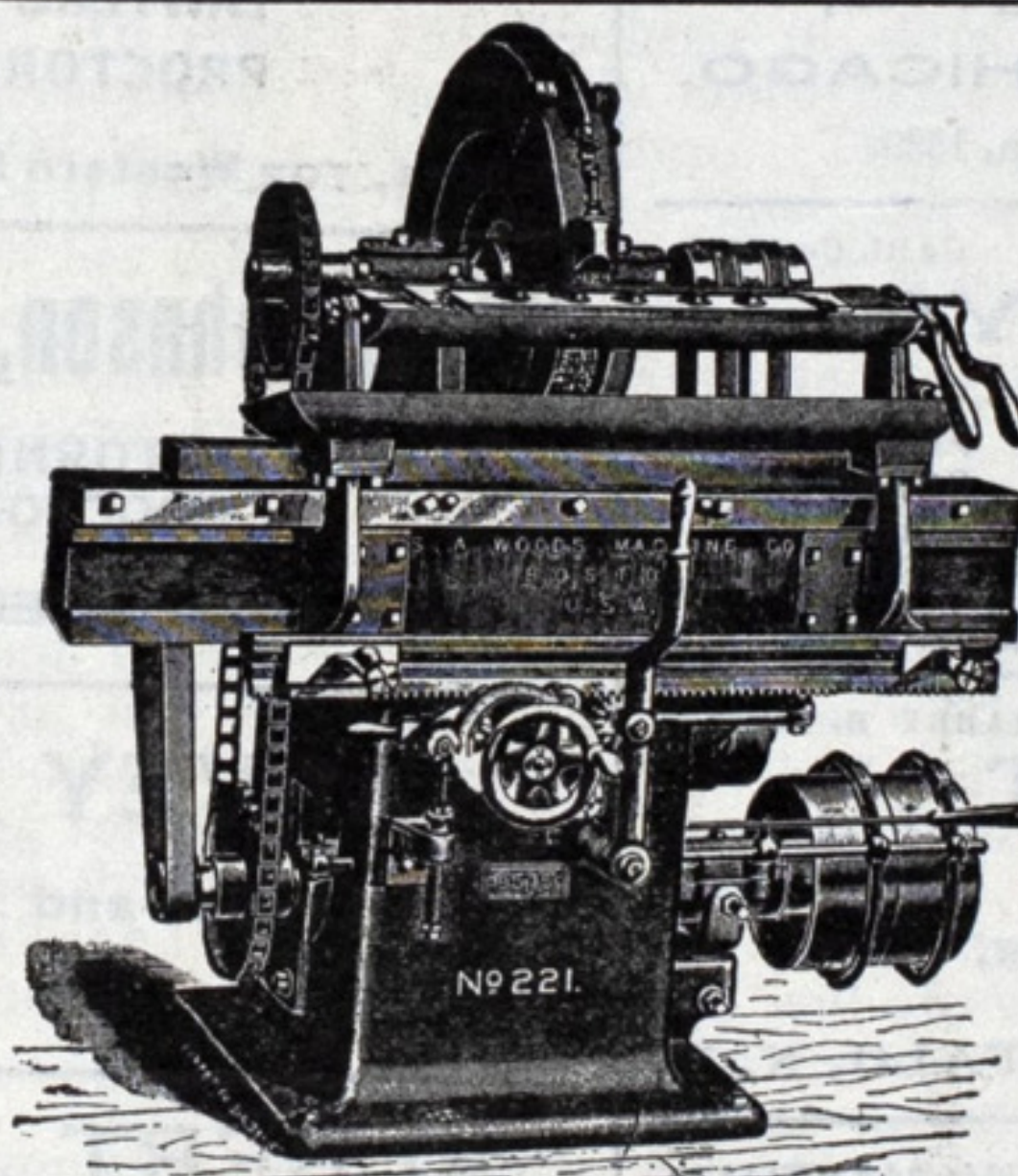
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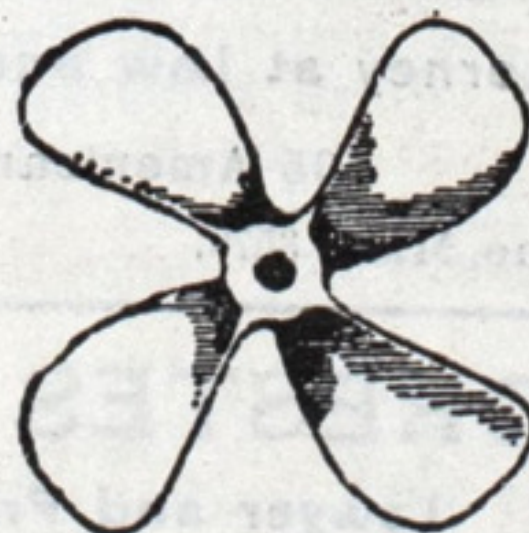
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